

**Round Test 2020-2 on  
Stickiness Characterization Methods**

**- FINAL REPORT –**

**date: December 17, 2020**

**Stickiness Task Force of the 'International Committee  
on Cotton Testing Methods' (ICCTM) of the  
'International Textile Manufacturers Federation'  
(ITMF)**

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## Introduction

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## Confidentiality and use of information from this report

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This report is both public and confidential:

- It is public as it will be released on the internet website of the ITMF ([www.itmf.org](http://www.itmf.org)) without providing any private information.
- It also is confidential as we provide Participating Laboratories with their own confidential laboratory LabID code that gives access to understanding each piece of information of the report; indeed with this LabID code number, more information can be extracted from the report. Please note that this LabID is changed for each test.

The Authors will not be held responsible to any degree for dissemination of the LabID code after the confidential distribution of their LabID code to the participating laboratories.

Gourlot Jean-Paul, Drieling Axel, Froese Karsten, Lassus Serge. 2020. Round Test 2020-2 on stickiness characterization methods - Final report. Montpellier : CIRAD-ITMF, 111 p.

## Preparation of cottons and samples

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A range of five cottons was selected for their stickiness potential range. Basically, the stickiness level of these cottons is not known a priori and their level is being better known after the test, expecting that these cottons cover a range of stickiness.

All cottons in this test got a similar level of homogenization using an homogenizing machine developed during CFC/ICAC/33 project ‘CSITC’ project (so called CSITC homogenizing machine). The main goal of this preparation is to ensure that any drawn sample from the original mass would carry the “same” stickiness potential as any other sample for evaluating the laboratory performance, but without affecting too much the size of individual sticky points that could affect some measurement methods.

The degree of this preparation affects the distribution of sticky points within the mass of the fibers. When an homogenization is ‘perfectly performed’, then the sticky point distribution follows Poisson’s distribution within the fibers; in other cases, sticky point distribution follows over-dispersed distributions, such as negative binomial distributions, meaning that sticky points may be ‘grouped’ in some parts of the material while the rest of the material remains free of stickiness. In these conditions, many repetitions of measurements are required to statistically compare laboratory performances or method performances.

From the beginning, we knew that homogenizing the cottons would induce some ‘preparation’, and this was several times reported to us with the results. However, this has been the only way to ensure that all samples

would be ‘alike’ for any given cotton in order to compare method performances or laboratory performances within methods.

Once the cottons were homogenized, samples were drawn from their original cotton mass, and sets of cottons were constituted for each participating laboratory, whatever the method used. Envelopes were sent out to laboratories in mid September 2020.

All laboratories were supposed to send their results back by December 11, 2020. This FINAL REPORT is prepared after this date when most Laboratories who received the material lately sent back their results.

**Organizing this round-test, at present running for free, takes time and uses precious materials; therefore we really appreciate when all registered Laboratories who received RT samples provide us with results.**

## Organization of this report

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As stated in the Contents,

- Individual results provided by Participating Laboratories are reported, cotton by cotton, sorted by method and then by LabID. A mail is sent out in a confidential manner to each participating laboratory for reading this public report, and therefore getting more out of it.
- Statistics are then presented in summary tables or in charts, cotton by cotton, sorted by method and then by LabID. This section allows the comparison of results by LabID within each method. Both the mean results and the variation of individual results are then highlighted.
- Correlation matrix are given for comparing LabID Mean results cotton by cotton, and sorted by method.
- Charts linking the within-laboratory variances of LabIDs for each method to the calculated mean results per LabID are displayed. Precision and accuracy of individual LabID performance can be deduced from these charts.
- Finally, distances between LabID mean result to the Grand Mean are displayed by method, sorted by method and by LabID.

The general comment on the RT results which was part of the confidential letter to the Participating Laboratories until RT2019-1 is now part of this report under the section “General conclusions about the results of this round-test” and is not part of the indicated letter anymore.

## Conversion of ‘laboratories raw records’ into numeric data for use in this report

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Answers to this round-test were provided **freely** by laboratories in a table having five columns (one per cotton) and six lines (for potentially recording six results for each cotton) for a total of 30 table cells.

For comparing results between laboratories, results were expected to be reported in a coordinated and harmonized manner within each method. However, for this test also, laboratories reported results the way they probably are used to do in their every day practice: the observation is that the report was not always harmonized within methods.

Under necessity and for allowing a comparison, we may be obliged to convert some laboratory records into harmonized numeric values by applying the following rules when needed (most acronyms are explained in the ‘Frequently asked questions’ section):

- For Caramelization : one measurement = one cell. No transformation of the data.
- For Clinitest: >1: was converted into 1.5.
- For Contest and Fibermap: Since RT2018-1 included: these devices are using the same technology for characterizing stickiness and their results are grouped together into one single ‘Contest-Fibermap’ category. Since March 2020, Contest-S was recognized by ITMF-ICCTM, and therefore Contest-S becomes the nam of this category. No transformation of the data.
- For GB/T13785-1992: one measurement = one cell. No transformation of the data.
- For H2SD: one measurement = one cell. No transformation of the data.
- For HSI-NIR: one measurement = one cell. No transformation of the data that has been calibrated to H2SD count at the beginning.
- For KOTITI: grades were converted into numeric values as follows:
  - A: 0
  - A+ = B-: 1
  - B: 2
  - B+ = C-: 3
  - C: 4
  - C+ = D-: 5
  - D: 6
  - D+ = E-: 7
  - E: 8
  - E+: 9.
- For minicard: ITMF grades 0 to 3 were used for reporting, one measurement = one cell. No transformation of the data.

- For Qualitative:
  - NIL: 0
  - Trace: 1
  - Light: 2
  - Moderate : 3.
- For SCT: one measurement = one record = sum of reading of top foil + reading of bottom foil.
- For TDM-A: one measurement = one record. No transformation of the data.



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All individual results per Method and LabID for each cotton <sup>1</sup>

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<sup>1</sup>Footnote

\* Results sorted by Method and then by LabID.

\* NA or NaN : no results provided.

**Table for Cotton A**

Meth	LabID	R1	R2	R3	R4	R5	R6	Un
Carameliza	5	2.5	3.1	NA	NA	NA	NA	Color degree
Carameliza	30	2.8	NA	NA	NA	NA	NA	Color degree
Carameliza	45	1.6	NA	NA	NA	NA	NA	Color degree
Contest-S	50	227.0	158.0	191.0	164.0	246.0	249.0	C/F Grade
Contest-S	70	411.0	248.0	356.0	286.0	263.0	263.0	C/F Grade
Contest-S	75	581.0	539.0	481.0	312.0	368.0	463.0	C/F Grade
Contest-S	80	325.0	443.0	489.0	492.0	480.0	450.0	C/F Grade
H2SD	10	33.0	35.0	48.0	35.0	59.0	33.0	Sticky point
H2SD	35	42.0	36.0	39.0	39.0	38.0	40.0	Sticky point
H2SD	60	10.0	35.0	23.0	38.0	27.0	14.0	Sticky point
H2SD	85	25.0	27.0	36.0	38.0	32.0	NA	Sticky point
KOTITI	40	8.0	8.0	8.0	8.0	8.0	8.0	KOTITI Grade
Minicard	15	1.5	1.5	1.8	NA	NA	NA	ITMF Grade
Qualitativ	90	2.0	2.0	2.0	1.0	1.0	1.0	Grade
Quantitati	95	0.3	0.4	0.4	0.4	0.4	0.4	Percent
SCT	20	24.0	31.0	27.0	NA	NA	NA	Sticky point
SCT	25	44.0	36.0	26.0	NA	NA	NA	Sticky point
SCT	55	15.0	17.0	19.0	16.0	22.0	16.0	Sticky point
SCT	65	63.0	67.0	63.0	65.0	62.0	60.0	Sticky point
SCT	100	36.0	48.0	40.0	NA	NA	NA	Sticky point
SCT	105	26.0	21.0	24.0	21.0	21.0	25.0	Sticky point

**Table for Cotton B**

Meth	LabID	R1	R2	R3	R4	R5	R6	Un
Carameliza	5	2.4	3.2	NA	NA	NA	NA	Color degree
Carameliza	30	2.5	NA	NA	NA	NA	NA	Color degree
Carameliza	45	1.9	NA	NA	NA	NA	NA	Color degree
Contest-S	50	387.0	293.0	315.0	218.0	239.0	243.0	C/F Grade
Contest-S	70	410.0	492.0	377.0	252.0	480.0	304.0	C/F Grade
Contest-S	75	595.0	514.0	558.0	540.0	466.0	450.0	C/F Grade
Contest-S	80	466.0	380.0	472.0	401.0	481.0	575.0	C/F Grade
H2SD	10	54.0	25.0	43.0	53.0	43.0	64.0	Sticky point
H2SD	35	30.0	27.0	32.0	39.0	35.0	31.0	Sticky point
H2SD	60	16.0	23.0	20.0	32.0	20.0	32.0	Sticky point
H2SD	85	42.0	38.0	36.0	24.0	42.0	NA	Sticky point
KOTITI	40	8.0	8.0	8.0	8.0	8.0	8.0	KOTITI Grade
Minicard	15	2.0	1.0	0.5	NA	NA	NA	ITMF Grade
Qualitativ	90	2.0	2.0	2.0	1.0	1.0	1.0	Grade
Quantitati	95	0.5	0.6	0.5	0.6	0.4	0.4	Percent
SCT	20	36.0	34.0	51.0	NA	NA	NA	Sticky point
SCT	25	54.0	54.0	50.0	NA	NA	NA	Sticky point
SCT	55	50.0	47.0	47.0	42.0	49.0	39.0	Sticky point
SCT	65	52.0	58.0	55.0	60.0	57.0	58.0	Sticky point
SCT	100	86.0	93.0	98.0	NA	NA	NA	Sticky point
SCT	105	36.0	33.0	31.0	36.0	36.0	40.0	Sticky point

**Table for Cotton C**

Meth	LabID	R1	R2	R3	R4	R5	R6	Un
Carameliza	5	3.7	4.5	NA	NA	NA	NA	Color degree
Carameliza	30	3.0	NA	NA	NA	NA	NA	Color degree
Carameliza	45	2.0	NA	NA	NA	NA	NA	Color degree
Contest-S	50	23.0	8.0	9.0	41.0	21.0	19.0	C/F Grade
Contest-S	70	94.0	102.0	38.0	97.0	67.0	53.0	C/F Grade
Contest-S	75	41.0	50.0	57.0	92.0	70.0	69.0	C/F Grade
Contest-S	80	49.0	40.0	41.0	9.0	45.0	63.0	C/F Grade
H2SD	10	2.0	11.0	5.0	17.0	12.0	8.0	Sticky point
H2SD	35	5.0	3.0	4.0	4.0	5.0	5.0	Sticky point
H2SD	60	4.0	0.0	0.0	4.0	6.0	2.0	Sticky point
H2SD	85	3.0	6.0	3.0	6.0	2.0	NA	Sticky point
KOTITI	40	4.0	5.0	5.0	5.0	5.0	5.0	KOTITI Grade
Minicard	15	0.2	0.2	0.0	NA	NA	NA	ITMF Grade
Qualitativ	90	2.0	2.0	2.0	1.0	1.0	1.0	Grade
Quantitati	95	0.4	0.4	0.4	0.4	0.3	0.3	Percent
SCT	20	1.0	3.0	5.0	NA	NA	NA	Sticky point
SCT	25	3.0	11.0	12.0	NA	NA	NA	Sticky point
SCT	55	8.0	5.0	8.0	6.0	9.0	5.0	Sticky point
SCT	65	7.0	8.0	9.0	7.0	7.0	8.0	Sticky point
SCT	100	15.0	12.0	11.0	NA	NA	NA	Sticky point
SCT	105	8.0	10.0	9.0	7.0	6.0	12.0	Sticky point

**Table for Cotton D**

Meth	LabID	R1	R2	R3	R4	R5	R6	Un
Carameliza	5	2.9	3.2	NA	NA	NA	NA	Color degree
Carameliza	30	3.3	NA	NA	NA	NA	NA	Color degree
Carameliza	45	2.7	NA	NA	NA	NA	NA	Color degree
Contest-S	50	367.0	275.0	297.0	270.0	246.0	222.0	C/F Grade
Contest-S	70	325.0	255.0	308.0	307.0	347.0	160.0	C/F Grade
Contest-S	75	383.0	301.0	216.0	271.0	293.0	239.0	C/F Grade
Contest-S	80	290.0	453.0	439.0	384.0	329.0	287.0	C/F Grade
H2SD	10	28.0	25.0	36.0	40.0	41.0	49.0	Sticky point
H2SD	35	15.0	25.0	22.0	29.0	25.0	15.0	Sticky point
H2SD	60	20.0	17.0	19.0	26.0	17.0	15.0	Sticky point
H2SD	85	20.0	20.0	20.0	15.0	28.0	NA	Sticky point
KOTITI	40	8.0	9.0	8.0	9.0	9.0	9.0	KOTITI Grade
Minicard	15	1.0	0.8	0.2	NA	NA	NA	ITMF Grade
Qualitativ	90	3.0	3.0	3.0	2.0	2.0	2.0	Grade
Quantitati	95	0.5	0.5	0.4	0.4	0.4	0.4	Percent
SCT	20	33.0	33.0	29.0	NA	NA	NA	Sticky point
SCT	25	34.0	33.0	26.0	NA	NA	NA	Sticky point
SCT	55	27.0	25.0	23.0	22.0	28.0	23.0	Sticky point
SCT	65	52.0	53.0	52.0	52.0	57.0	54.0	Sticky point
SCT	100	28.0	55.0	33.0	NA	NA	NA	Sticky point
SCT	105	22.0	16.0	19.0	18.0	28.0	19.0	Sticky point

**Table for Cotton E**

Meth	LabID	R1	R2	R3	R4	R5	R6	Un
Carameliza	5	4.4	4.7	NA	NA	NA	NA	Color degree
Carameliza	30	3.2	NA	NA	NA	NA	NA	Color degree
Carameliza	45	3.4	NA	NA	NA	NA	NA	Color degree
Contest-S	50	5.0	29.0	16.0	10.0	44.0	24.0	C/F Grade
Contest-S	70	45.0	42.0	93.0	29.0	41.0	53.0	C/F Grade
Contest-S	75	53.0	69.0	74.0	26.0	48.0	58.0	C/F Grade
Contest-S	80	77.0	26.0	69.0	44.0	72.0	27.0	C/F Grade
H2SD	10	2.0	5.0	2.0	2.0	15.0	3.0	Sticky point
H2SD	35	4.0	3.0	2.0	4.0	2.0	2.0	Sticky point
H2SD	60	1.0	4.0	0.0	4.0	4.0	1.0	Sticky point
H2SD	85	4.0	6.0	4.0	8.0	6.0	NA	Sticky point
KOTITI	40	3.0	2.0	2.0	2.0	2.0	2.0	KOTITI Grade
Minicard	15	0.5	0.2	0.0	NA	NA	NA	ITMF Grade
Qualitativ	90	0.0	0.0	0.0	0.0	0.0	0.0	Grade
Quantitati	95	0.3	0.3	0.3	0.3	0.4	0.4	Percent
SCT	20	2.0	0.0	1.0	NA	NA	NA	Sticky point
SCT	25	4.0	0.0	2.0	NA	NA	NA	Sticky point
SCT	55	1.0	0.0	0.0	1.0	0.0	1.0	Sticky point
SCT	65	1.0	2.0	0.0	1.0	0.0	1.0	Sticky point
SCT	100	3.0	4.0	7.0	NA	NA	NA	Sticky point
SCT	105	2.0	3.0	2.0	3.0	2.0	3.0	Sticky point

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## Statistics per Method, LabID for each cottons <sup>2</sup>

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<sup>2</sup>Footnote

- \* Mean of all readings per LabID (NA excluded, expressed in Unit).
- \* Var = variance taking care of all available readings per LabID (NA excluded).
- \* CV = CV between reading per LabID expressed in percent.
- \* GMean = Grand Mean of all laboratory means, calculated by Method.
- \* Delta = LabID Mean - GMean.
- \* NA or NaN : no result provided.

**Table for Cotton A**

Meth	LabID	MeanIntraLab	Un	VarIntraLab	CVIntraLab	MeanInterLab	Delta
Carameliza	5	2.8	Color degree	0.2	15.2	2.4	0.4
Carameliza	30	2.8	Color degree	NA	NA	2.4	0.4
Carameliza	45	1.6	Color degree	NA	NA	2.4	-0.8
Contest-S	50	205.8	C/F Grade	1636.6	19.7	353.5	-147.7
Contest-S	70	304.5	C/F Grade	4194.7	21.3	353.5	-49.0
Contest-S	75	457.3	C/F Grade	10331.5	22.2	353.5	103.8
Contest-S	80	446.5	C/F Grade	3957.1	14.1	353.5	93.0
H2SD	10	40.5	Sticky point	114.3	26.4	33.9	6.6
H2SD	35	39.0	Sticky point	4.0	5.1	33.9	5.1
H2SD	60	24.5	Sticky point	124.3	45.5	33.9	-9.4
H2SD	85	31.6	Sticky point	31.3	17.7	33.9	-2.3
KOTITI	40	8.0	KOTITI Grade	0.0	0.0	8.0	0.0
Minicard	15	1.6	ITMF Grade	0.0	9.1	1.6	0.0
Qualitativ	90	1.5	Grade	0.3	36.5	1.5	0.0
Quantitati	95	0.4	Percent	0.0	6.0	0.4	0.0
SCT	20	27.3	Sticky point	12.3	12.8	34.6	-7.3
SCT	25	35.3	Sticky point	81.3	25.5	34.6	0.7
SCT	55	17.5	Sticky point	6.7	14.8	34.6	-17.1
SCT	65	63.3	Sticky point	5.9	3.8	34.6	28.7
SCT	100	41.3	Sticky point	37.3	14.8	34.6	6.7
SCT	105	23.0	Sticky point	5.2	9.9	34.6	-11.6



**Table for Cotton B**

Meth	LabID	MeanIntraLab	Un	VarIntraLab	CVIntraLab	MeanInterLab	Delta
Carameliza	5	2.8	Color degree	0.3	20.2	2.4	0.4
Carameliza	30	2.5	Color degree	NA	NA	2.4	0.1
Carameliza	45	1.9	Color degree	NA	NA	2.4	-0.5
Contest-S	50	282.5	C/F Grade	3939.9	22.2	412.8	-130.3
Contest-S	70	385.8	C/F Grade	9081.8	24.7	412.8	-27.0
Contest-S	75	520.5	C/F Grade	3063.9	10.6	412.8	107.7
Contest-S	80	462.5	C/F Grade	4737.9	14.9	412.8	49.7
H2SD	10	47.0	Sticky point	178.0	28.4	34.9	12.1
H2SD	35	32.3	Sticky point	17.5	12.9	34.9	-2.6
H2SD	60	23.8	Sticky point	45.0	28.1	34.9	-11.1
H2SD	85	36.4	Sticky point	54.8	20.3	34.9	1.5
KOTITI	40	8.0	KOTITI Grade	0.0	0.0	8.0	0.0
Minicard	15	1.2	ITMF Grade	0.6	65.5	1.2	0.0
Qualitativ	90	1.5	Grade	0.3	36.5	1.5	0.0
Quantitati	95	0.5	Percent	0.0	20.6	0.5	0.0
SCT	20	40.3	Sticky point	86.3	23.0	53.8	-13.5
SCT	25	52.7	Sticky point	5.3	4.4	53.8	-1.2
SCT	55	45.7	Sticky point	18.3	9.4	53.8	-8.2
SCT	65	56.7	Sticky point	7.9	4.9	53.8	2.8
SCT	100	92.3	Sticky point	36.3	6.5	53.8	38.5
SCT	105	35.3	Sticky point	9.5	8.7	53.8	-18.5

**Table for Cotton C**

Meth	LabID	MeanIntraLab	Un	VarIntraLab	CVIntraLab	MeanInterLab	Delta
Carameliza	5	4.1	Color degree	0.3	13.8	3.0	1.1
Carameliza	30	3.0	Color degree	NA	NA	3.0	0.0
Carameliza	45	2.0	Color degree	NA	NA	3.0	-1.0
Contest-S	50	20.2	C/F Grade	143.4	59.4	49.9	-29.7
Contest-S	70	75.2	C/F Grade	698.2	35.2	49.9	25.3
Contest-S	75	63.2	C/F Grade	323.0	28.5	49.9	13.2
Contest-S	80	41.2	C/F Grade	317.8	43.3	49.9	-8.8
H2SD	10	9.2	Sticky point	28.6	58.3	5.0	4.1
H2SD	35	4.3	Sticky point	0.7	18.8	5.0	-0.7
H2SD	60	2.7	Sticky point	5.9	90.8	5.0	-2.4
H2SD	85	4.0	Sticky point	3.5	46.8	5.0	-1.0
KOTITI	40	4.8	KOTITI Grade	0.2	8.4	4.8	0.0
Minicard	15	0.2	ITMF Grade	0.0	86.6	0.2	0.0
Qualitativ	90	1.5	Grade	0.3	36.5	1.5	0.0
Quantitati	95	0.4	Percent	0.0	6.7	0.4	0.0
SCT	20	3.0	Sticky point	4.0	66.7	7.9	-4.9
SCT	25	8.7	Sticky point	24.3	56.9	7.9	0.8
SCT	55	6.8	Sticky point	3.0	25.2	7.9	-1.1
SCT	65	7.7	Sticky point	0.7	10.6	7.9	-0.2
SCT	100	12.7	Sticky point	4.3	16.4	7.9	4.8
SCT	105	8.7	Sticky point	4.7	24.9	7.9	0.8

**Table for Cotton D**

Meth	LabID	MeanIntraLab	Un	VarIntraLab	CVIntraLab	MeanInterLab	Delta
Carameliza	5	3.0	Color degree	0.0	7.0	3.0	0.0
Carameliza	30	3.3	Color degree	NA	NA	3.0	0.3
Carameliza	45	2.7	Color degree	NA	NA	3.0	-0.3
Contest-S	50	279.5	C/F Grade	2500.3	17.9	302.7	-23.2
Contest-S	70	283.7	C/F Grade	4594.3	23.9	302.7	-19.0
Contest-S	75	283.8	C/F Grade	3397.8	20.5	302.7	-18.8
Contest-S	80	363.7	C/F Grade	5315.1	20.0	302.7	61.0
H2SD	10	36.5	Sticky point	78.7	24.3	24.5	12.0
H2SD	35	21.8	Sticky point	33.0	26.3	24.5	-2.7
H2SD	60	19.0	Sticky point	14.8	20.2	24.5	-5.5
H2SD	85	20.6	Sticky point	21.8	22.7	24.5	-3.9
KOTITI	40	8.7	KOTITI Grade	0.3	6.0	8.7	0.0
Minicard	15	0.7	ITMF Grade	0.1	57.3	0.7	0.0
Qualitativ	90	2.5	Grade	0.3	21.9	2.5	0.0
Quantitati	95	0.5	Percent	0.0	10.1	0.5	0.0
SCT	20	31.7	Sticky point	5.3	7.3	33.3	-1.6
SCT	25	31.0	Sticky point	19.0	14.1	33.3	-2.3
SCT	55	24.7	Sticky point	5.9	9.8	33.3	-8.6
SCT	65	53.3	Sticky point	3.9	3.7	33.3	20.1
SCT	100	38.7	Sticky point	206.3	37.1	33.3	5.4
SCT	105	20.3	Sticky point	17.9	20.8	33.3	-12.9

**Table for Cotton E**

Meth	LabID	MeanIntraLab	Un	VarIntraLab	CVIntraLab	MeanInterLab	Delta
Carameliza	5	4.6	Color degree	0.0	4.7	3.7	0.8
Carameliza	30	3.2	Color degree	NA	NA	3.7	-0.5
Carameliza	45	3.4	Color degree	NA	NA	3.7	-0.3
Contest-S	50	21.3	C/F Grade	200.7	66.4	44.8	-23.4
Contest-S	70	50.5	C/F Grade	493.5	44.0	44.8	5.8
Contest-S	75	54.7	C/F Grade	291.9	31.3	44.8	9.9
Contest-S	80	52.5	C/F Grade	535.5	44.1	44.8	7.8
H2SD	10	4.8	Sticky point	26.2	105.8	3.9	0.9
H2SD	35	2.8	Sticky point	1.0	34.7	3.9	-1.1
H2SD	60	2.3	Sticky point	3.5	79.8	3.9	-1.6
H2SD	85	5.6	Sticky point	2.8	29.9	3.9	1.7
KOTITI	40	2.2	KOTITI Grade	0.2	18.8	2.2	0.0
Minicard	15	0.2	ITMF Grade	0.1	100.0	0.2	0.0
Qualitativ	90	0.0	Grade	0.0	NaN	0.0	0.0
Quantitati	95	0.3	Percent	0.0	15.9	0.3	0.0
SCT	20	1.0	Sticky point	1.0	100.0	1.9	-0.9
SCT	25	2.0	Sticky point	4.0	100.0	1.9	0.1
SCT	55	0.5	Sticky point	0.3	109.5	1.9	-1.4
SCT	65	0.8	Sticky point	0.6	90.3	1.9	-1.1
SCT	100	4.7	Sticky point	4.3	44.6	1.9	2.8
SCT	105	2.5	Sticky point	0.3	21.9	1.9	0.6

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## Data presented by boxplots per Method, LabID for each cotton <sup>3</sup>

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This section was appearing for the last time in RT2019-1 as the same information is given in the next section in a much more concise way; therefore next section only will remain in future reports from RT2019-2 on.

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<sup>3</sup>Footnote

\* NA excluded.

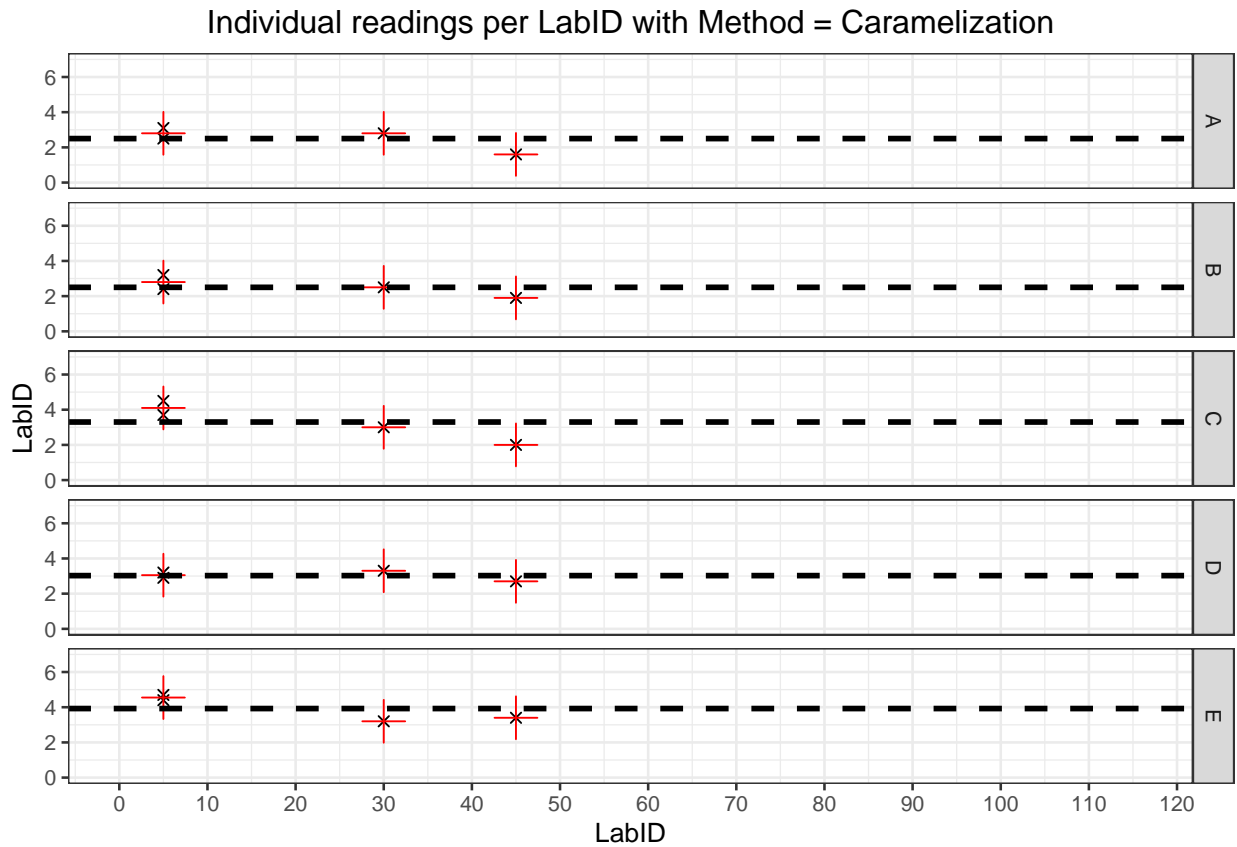
\* In each box, the bolded line represents the median of all individual results for the considered LabID.

\* The square represents the upper 75% (Q75) and lower 25% (Q25) percentiles of the individual results.

\* The whiskers represent the quantiles that included in  $\pm 1.5 * (Q75 - Q25)$ .

\* Extreme points may additionally be displayed by a point further out from the whiskers.

## Charts of individual readings per Method and LabID for each cotton<sup>4</sup>

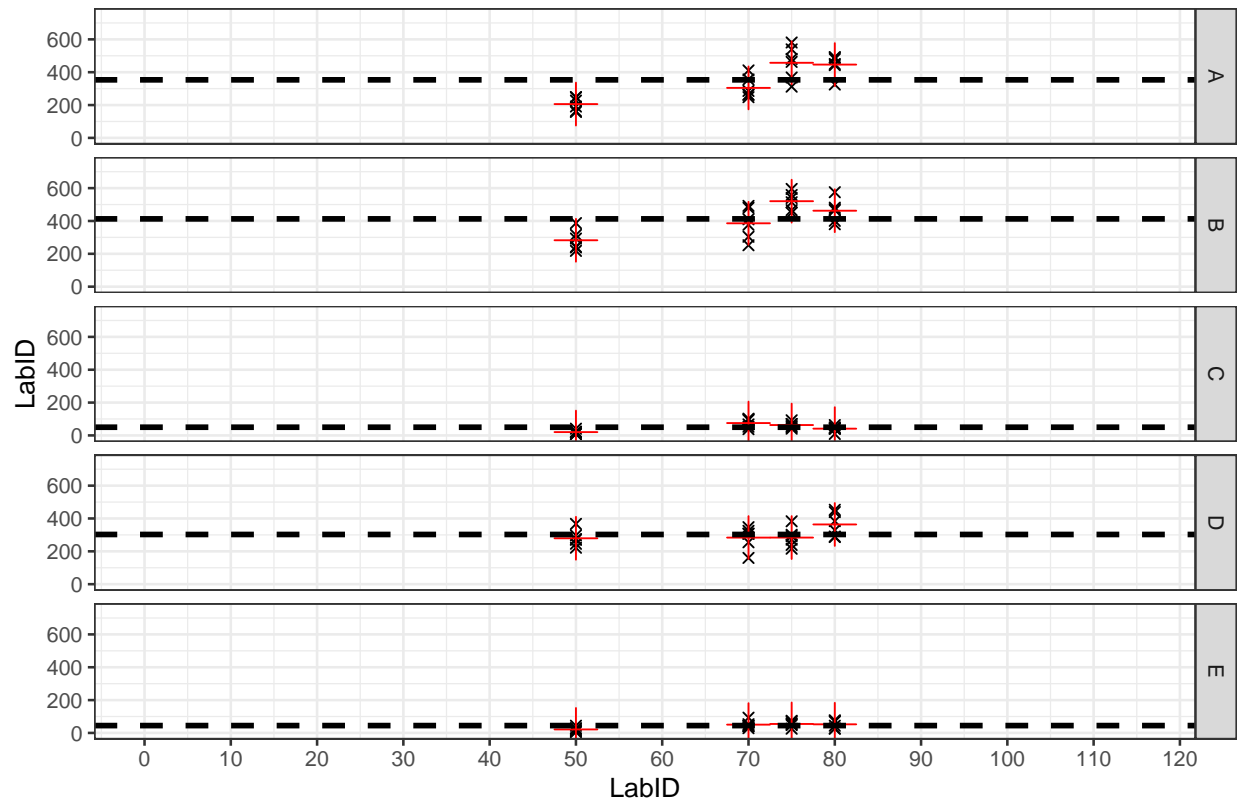


pdf 2

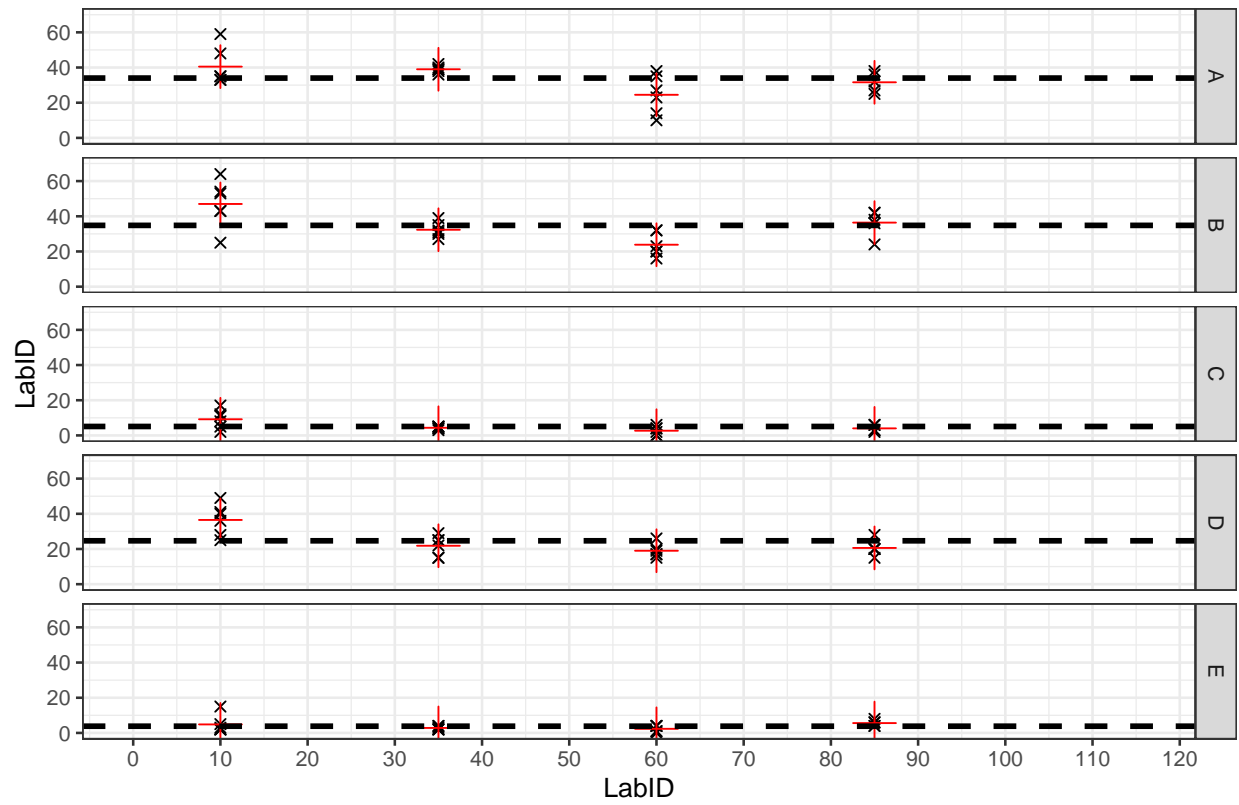
<sup>4</sup>Footnote

- \* NA excluded
- \* LabID are given in the abscissa axis at the bottom of the chart in the following charts.
- \* Black dashed line = Method GrandMean per cotton.
- \* Red + = Laboratory mean for the given method and for the given cotton.
- \* Black x = Laboratory individual reading for the given method and for the given cotton.

Individual readings per LabID with Method = Contest-S

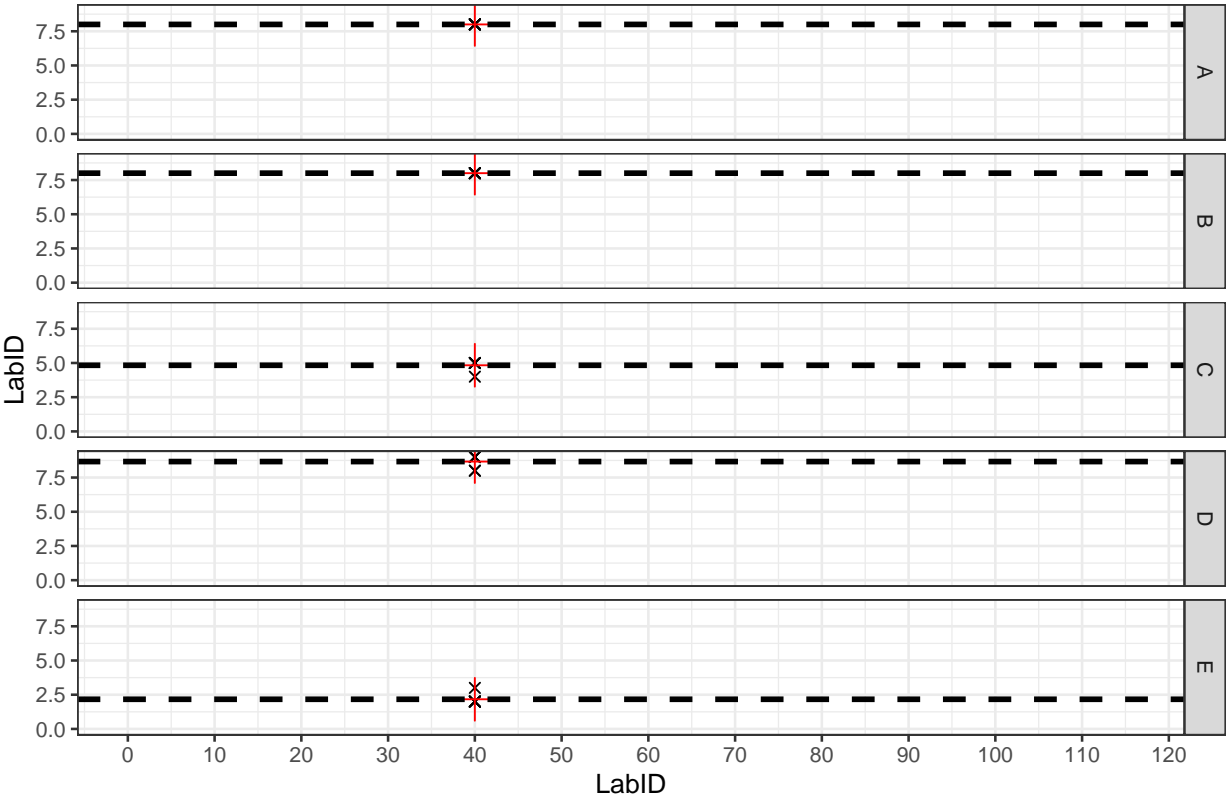


Individual readings per LabID with Method = H2SD

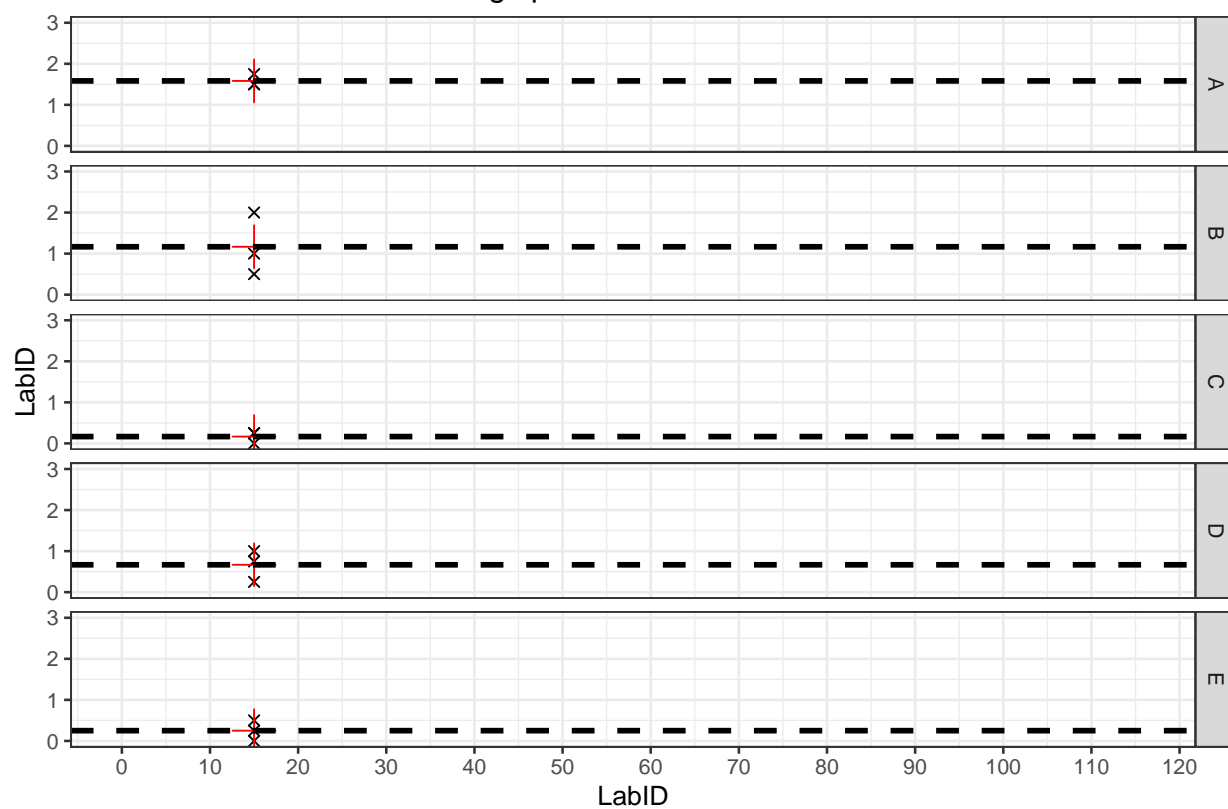




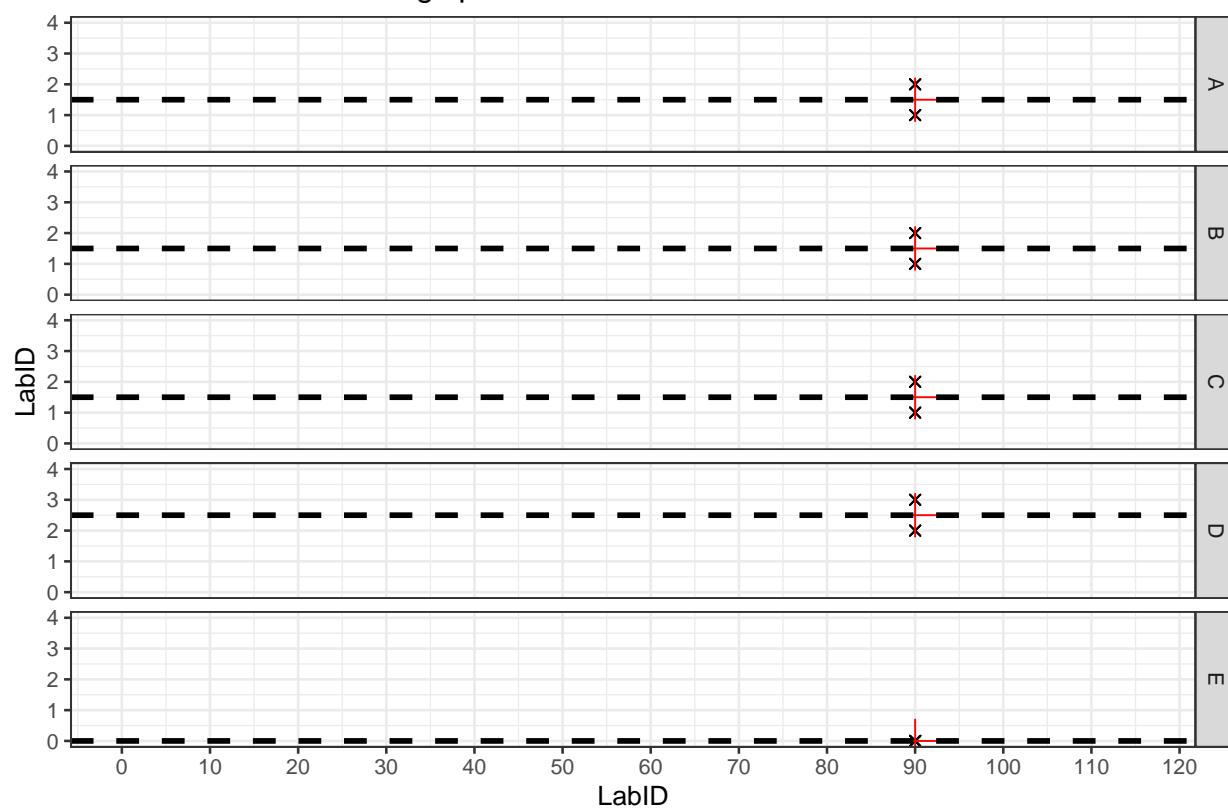
Individual readings per LabID with Method = KOTITI



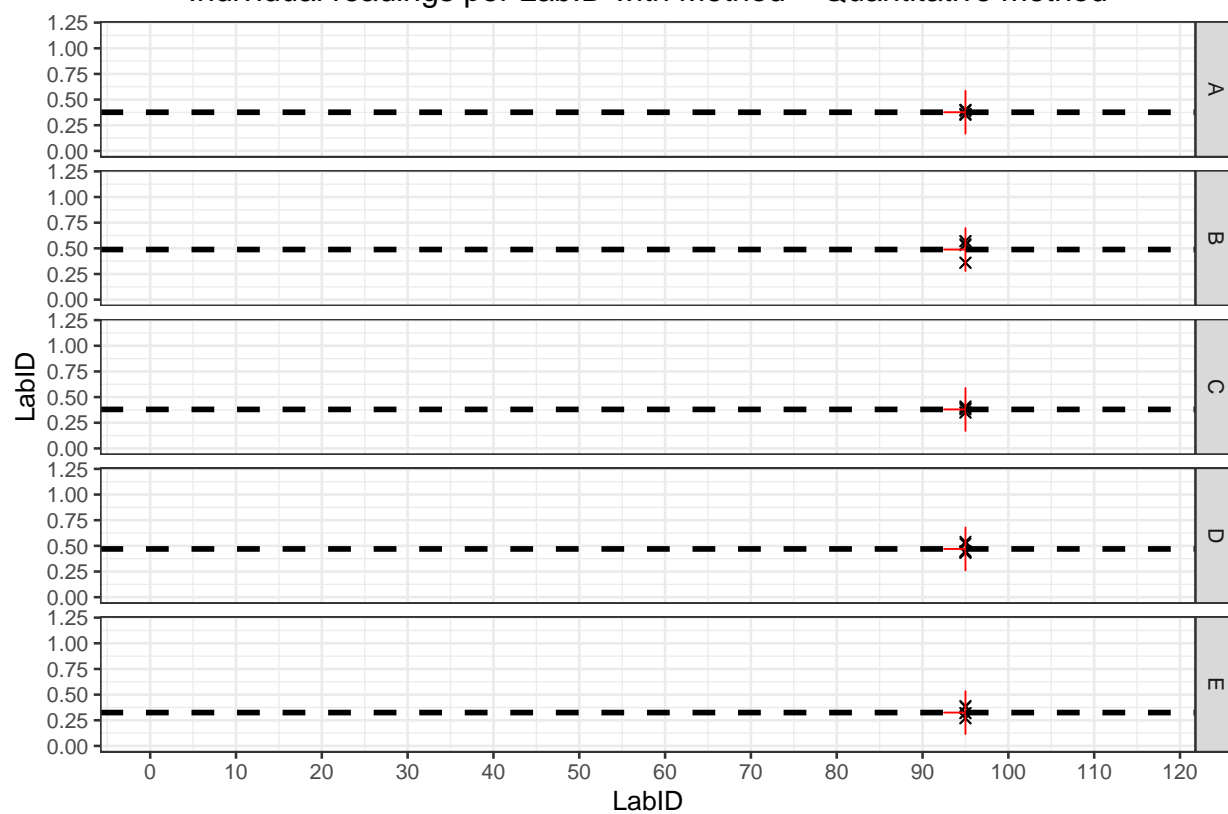
Individual readings per LabID with Method = Minicard



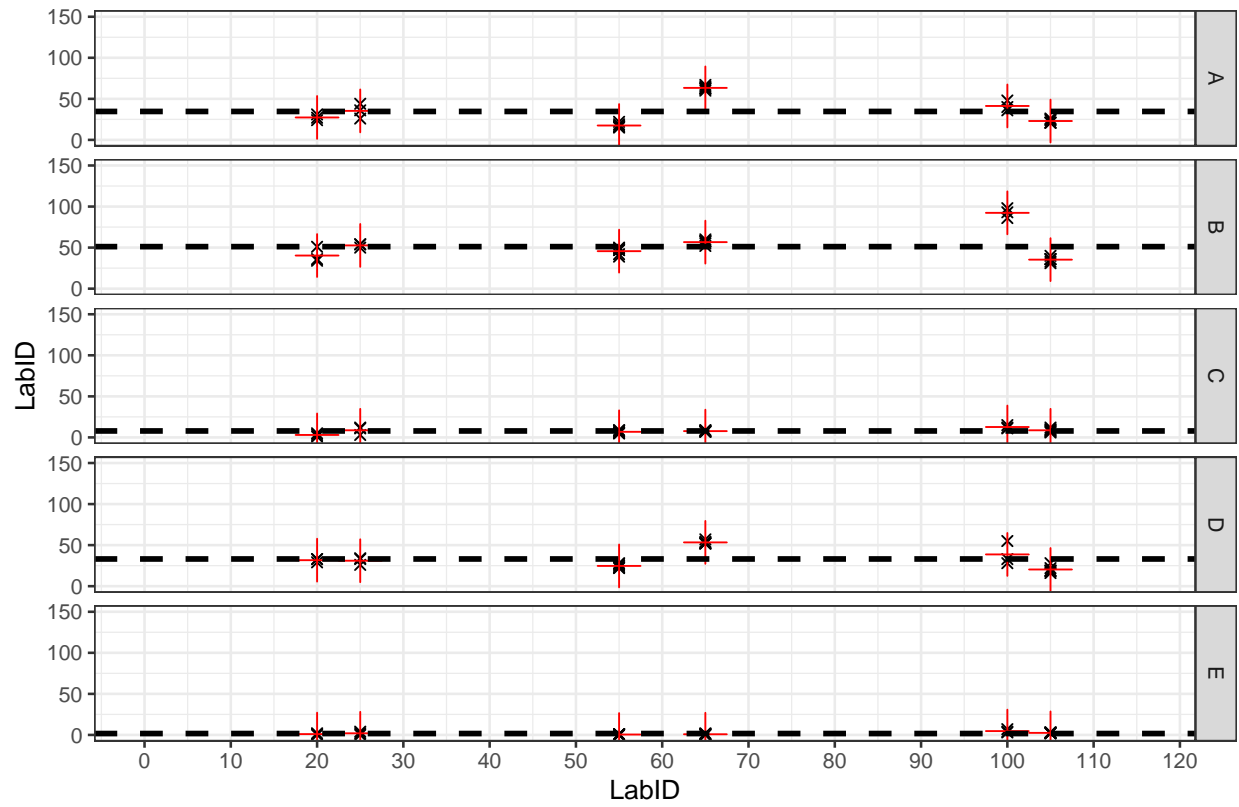
Individual readings per LabID with Method = Qualitative method



Individual readings per LabID with Method = Quantitative method

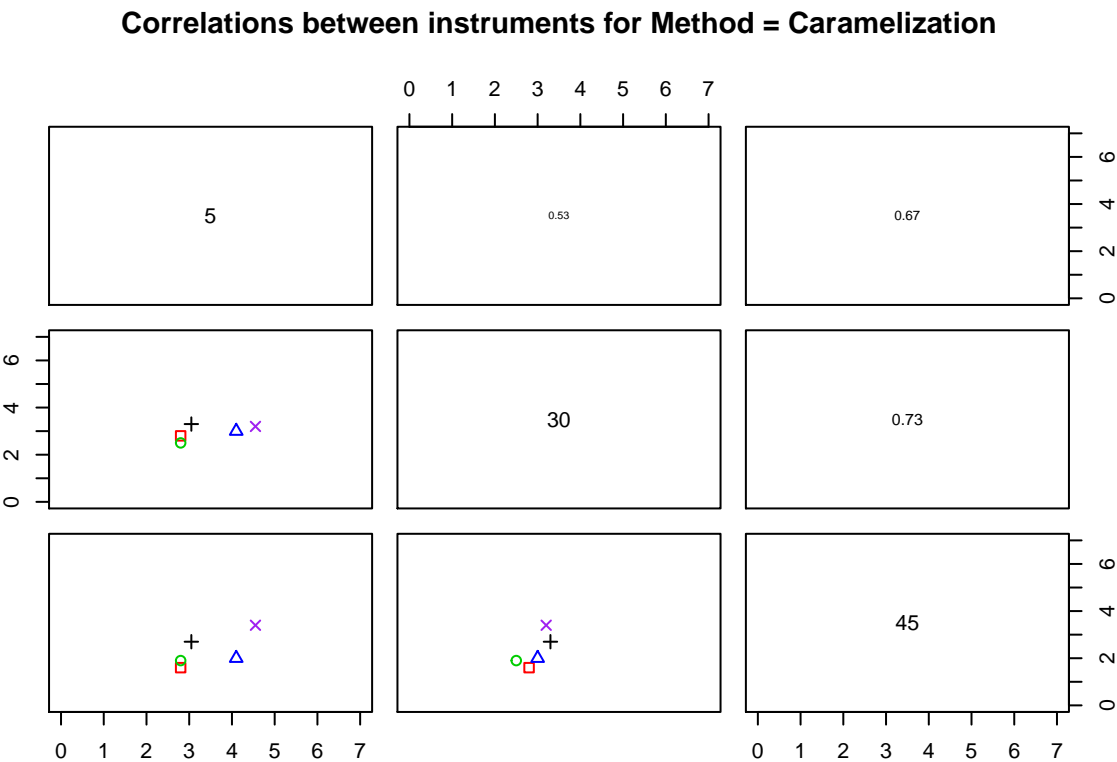


Individual readings per LabID with Method = SCT



Correlation charts and correlation values between LabID using a same Method for all cottons <sup>5</sup>

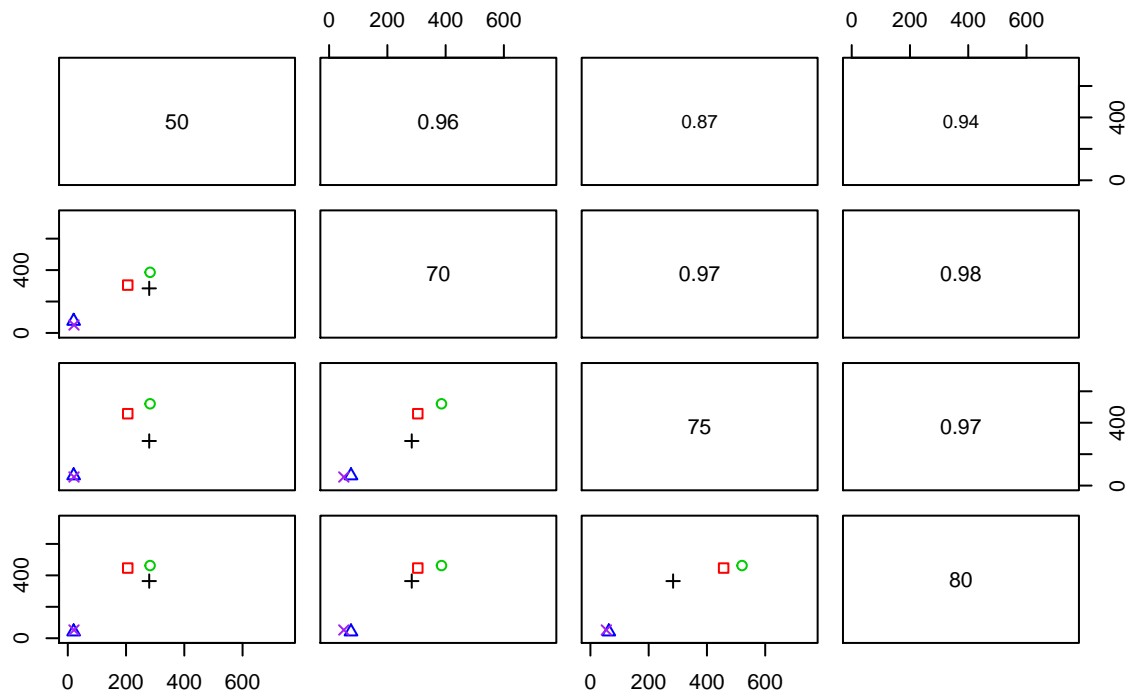
A correlation matrix of charts is provided only when two or more instruments were used for a given method.



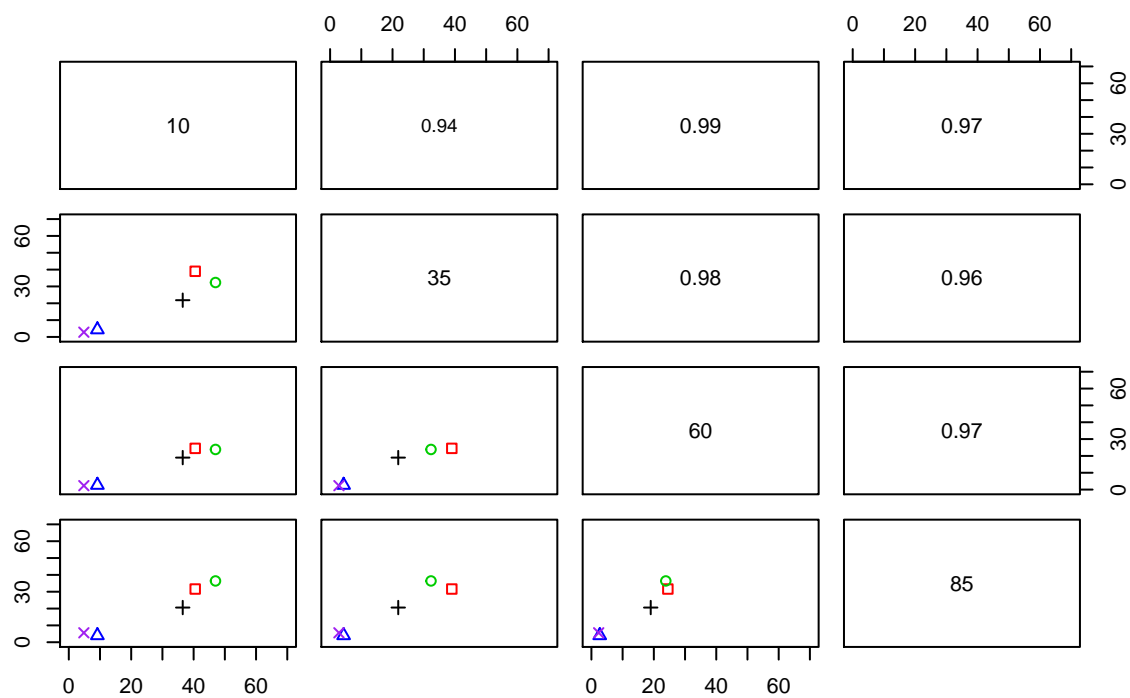
<sup>5</sup>Footnote

- \* Based on Means of available results (NA excluded)
- \* LabIDs are given in the diagonal of the matrix.
- \* Squares in red for Cotton A, rounds in green for Cotton B, triangles in blue for Cotton C, + in black for cotton D, and x in purple for cotton E.
- \* The lower left corner of the matrix provides the correlation charts, while the upper right corner of the matrix provides the corresponding raw correlation coefficients. Higher the correlation coefficient, larger the font size of the corresponding text.

# Correlations between instruments for Method = Contest-S

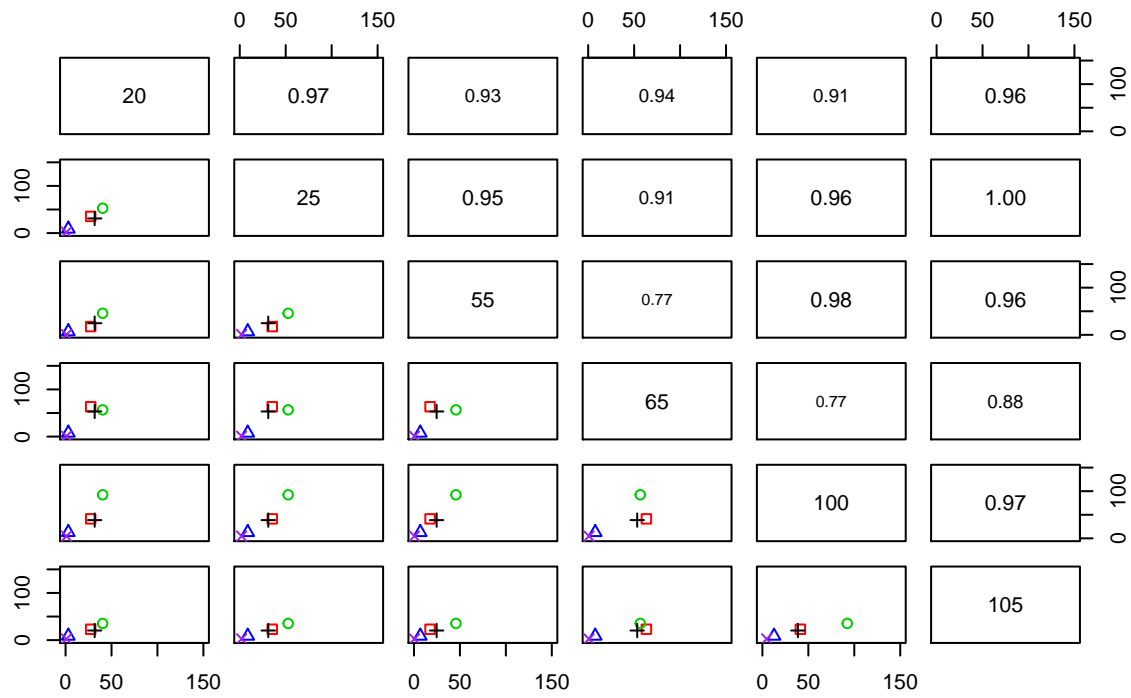


# Correlations between instruments for Method = H2SD





# Correlations between instruments for Method = SCT



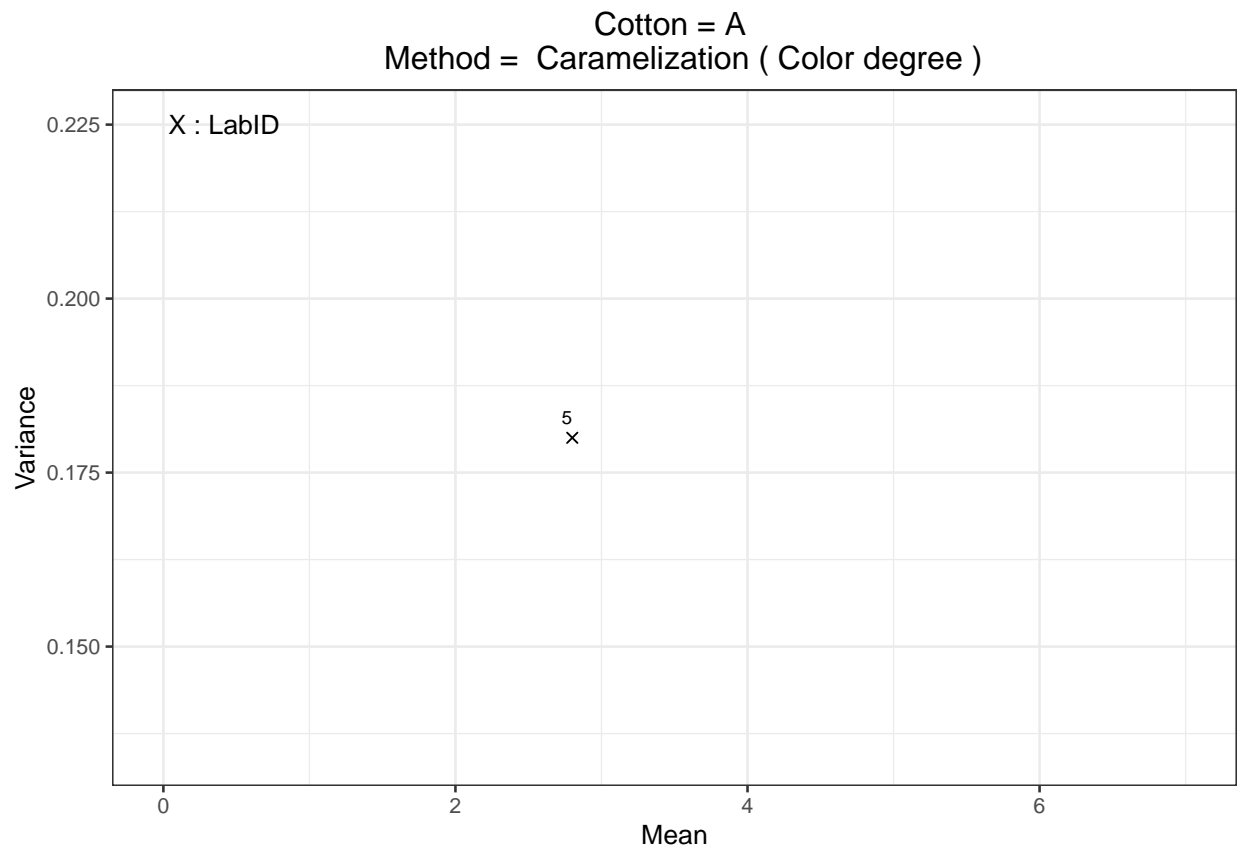
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## Charts Variance = f(Mean) for each Cotton and Method, taking care of LabIDs

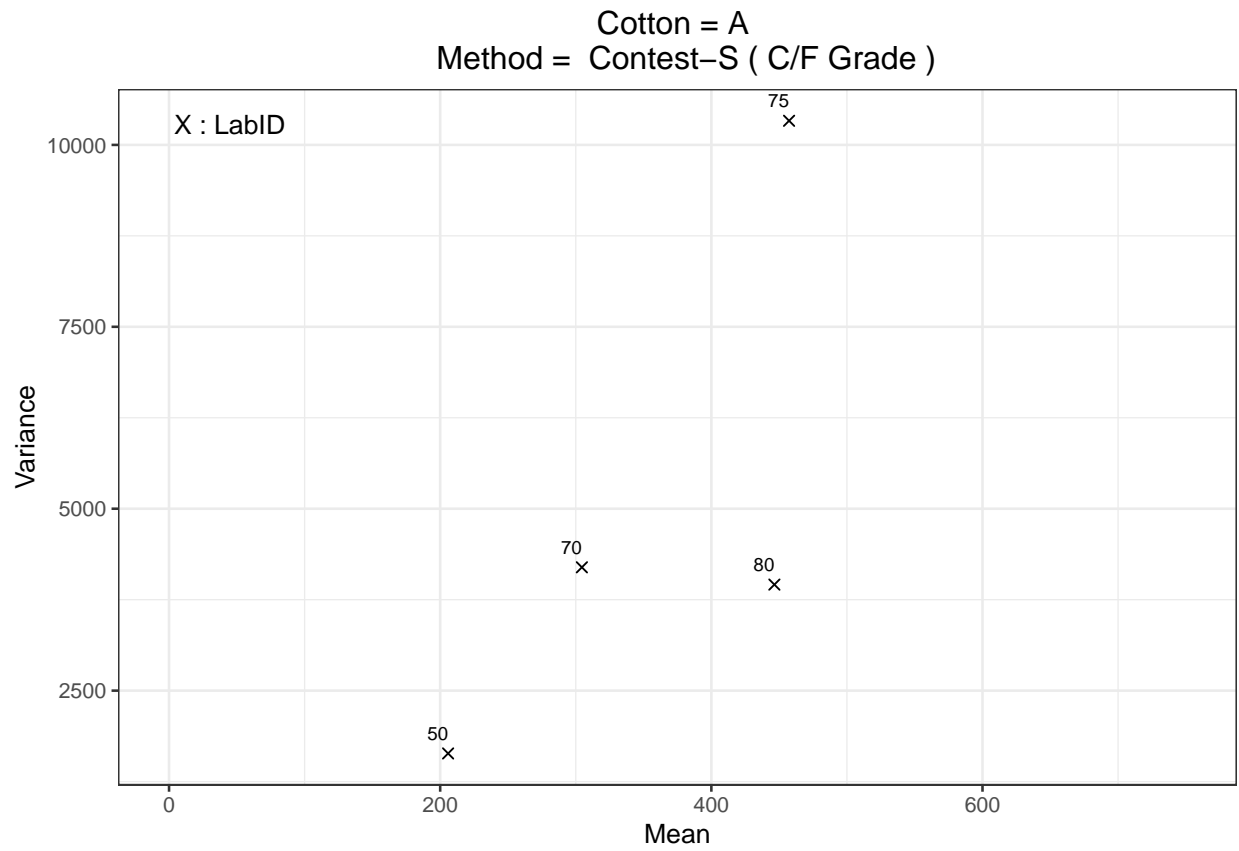
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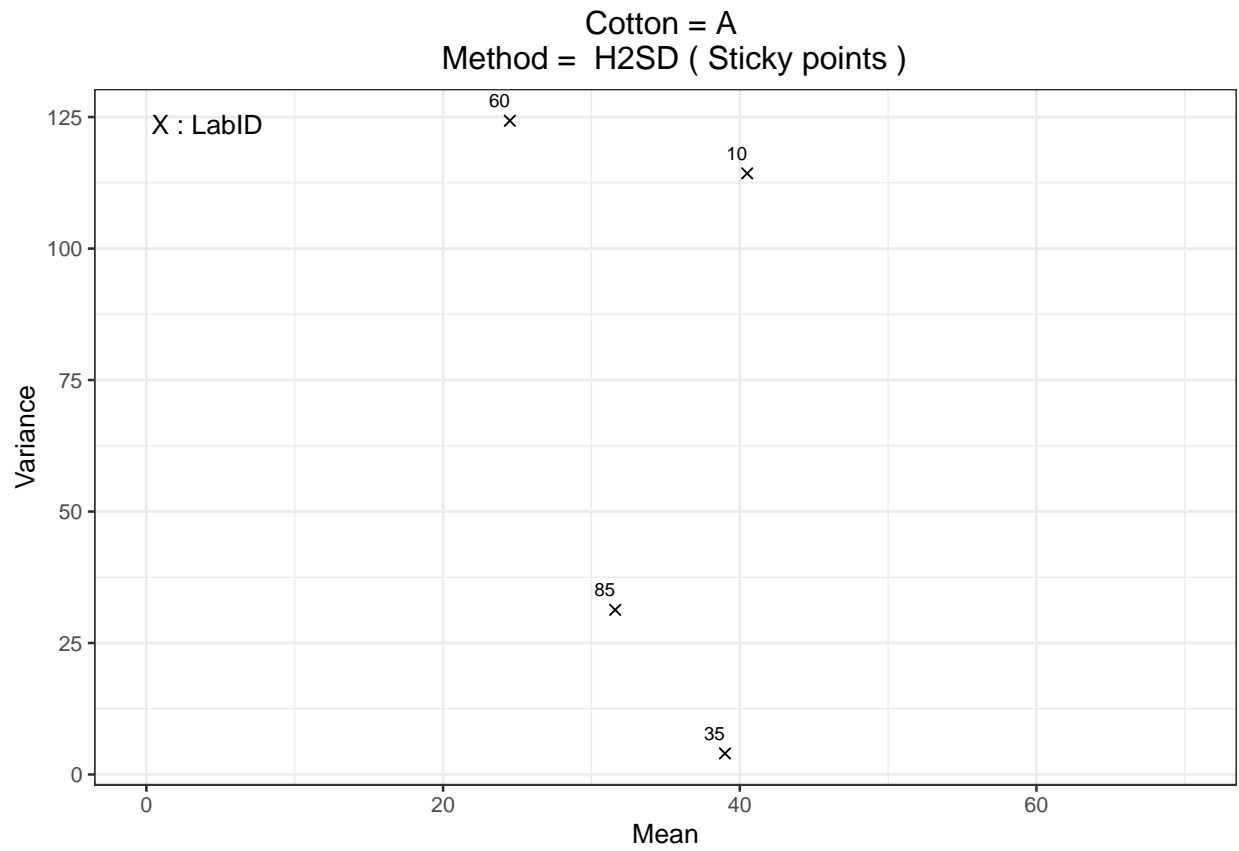
This type of chart is devoted to displaying the ability of laboratories to reproduce themselves for each cotton, based on the n readings (up to six) they provided for each cotton sample. Stickiness has the reputation to be heterogeneously distributed within samples (whatever the efforts we made for homogenizing cotton masses before dispatching representative samples); therefore, if methods are sensitive enough, then a certain level of variance (displayed on the vertical axis in the following charts) is to be seen when the number of measurements exceeds 1 in this test.

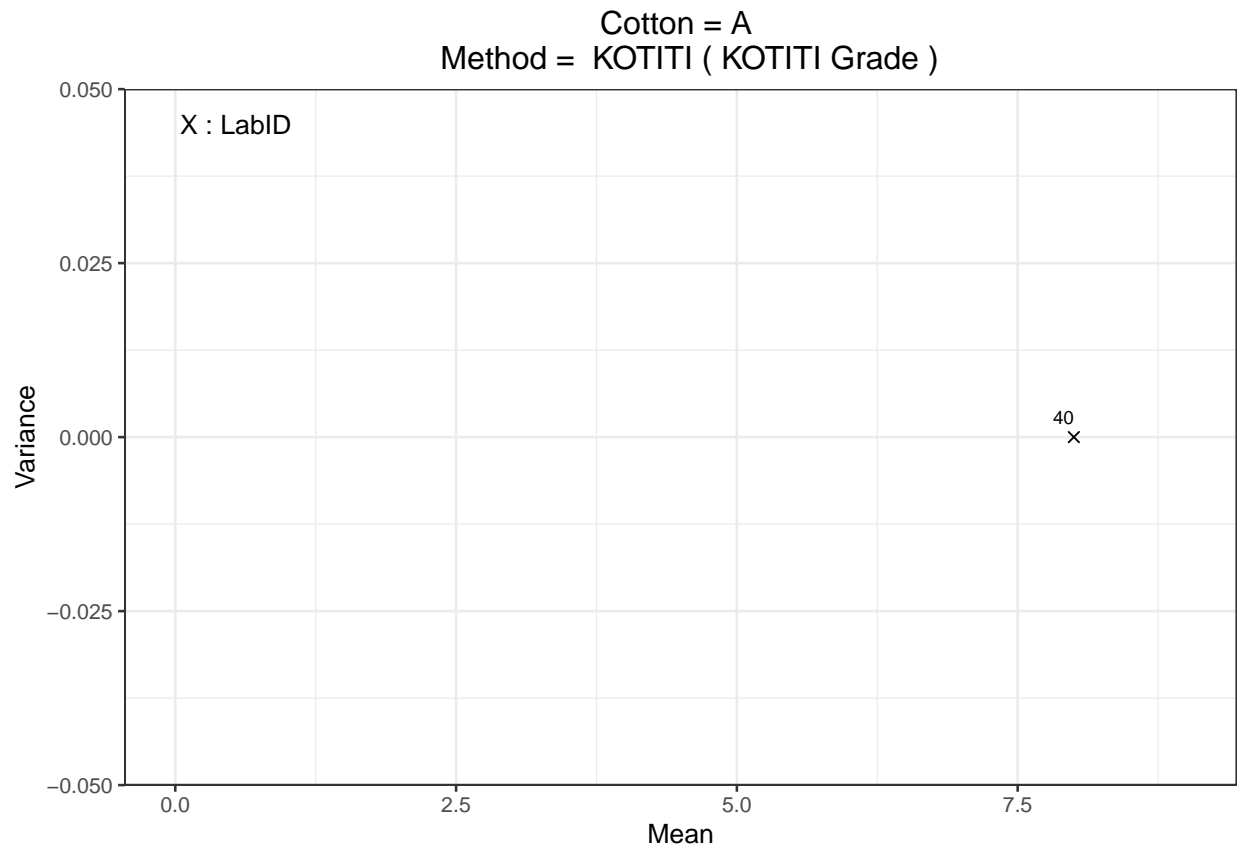
**Cotton A : Variance between individual measurements = f(Mean) for all concerned labs**



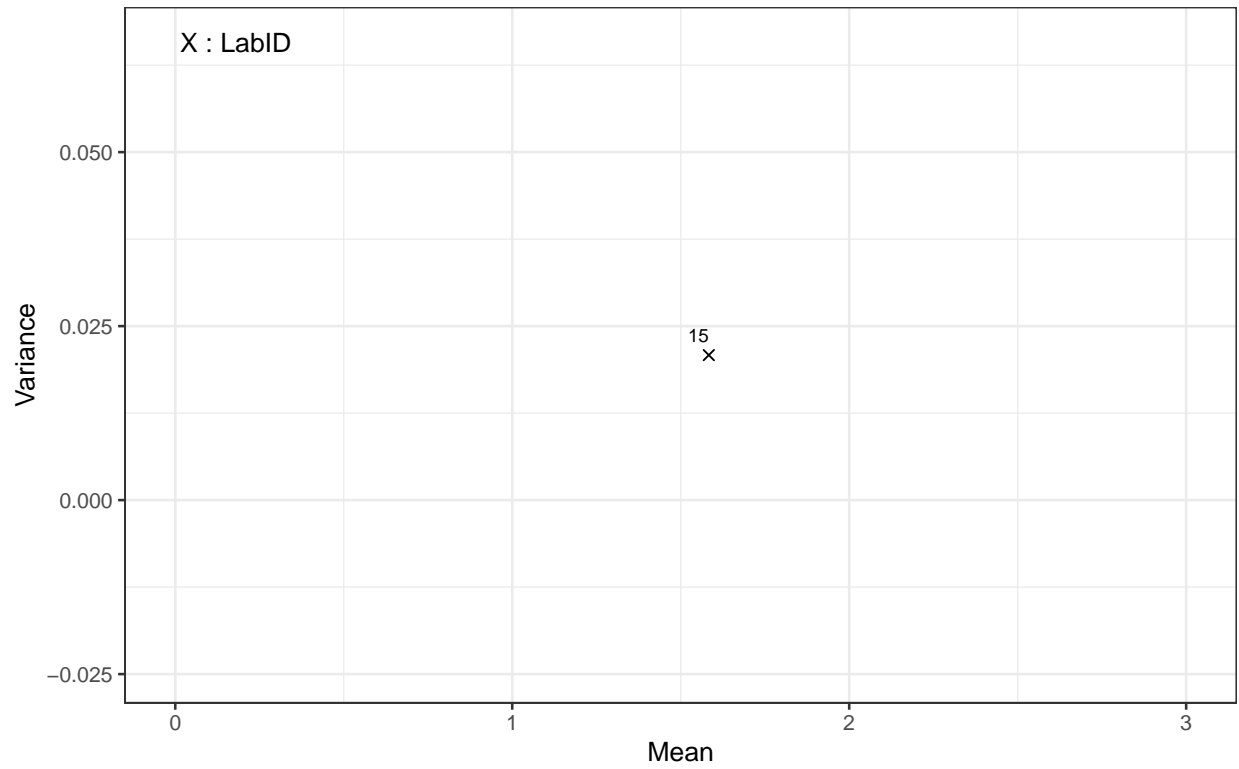
[1] “For Cotton = A and for method = Caramelization , 2 LabID (LabID being , 30, 45) cannot be shown on this chart as only one measurement was performed and, therefore, a variance cannot be calculated in this case.”

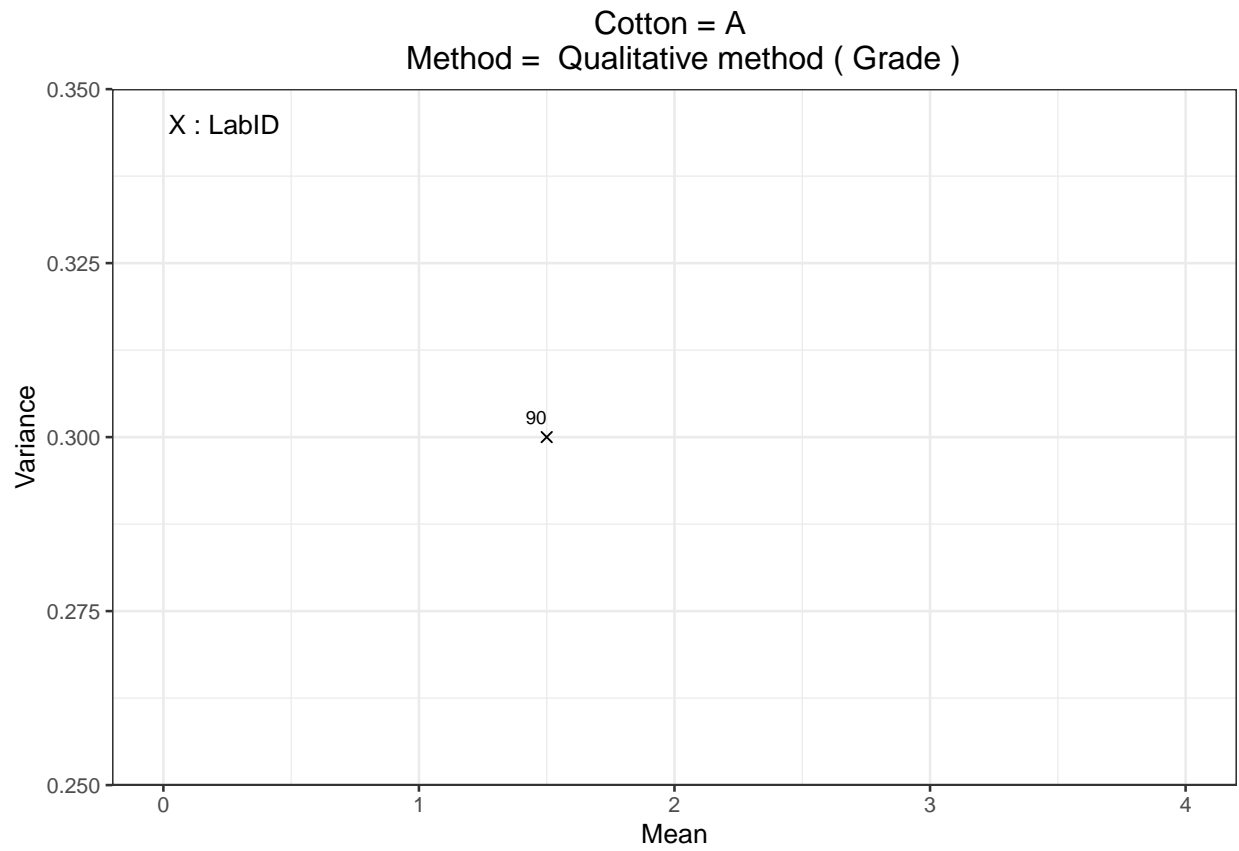


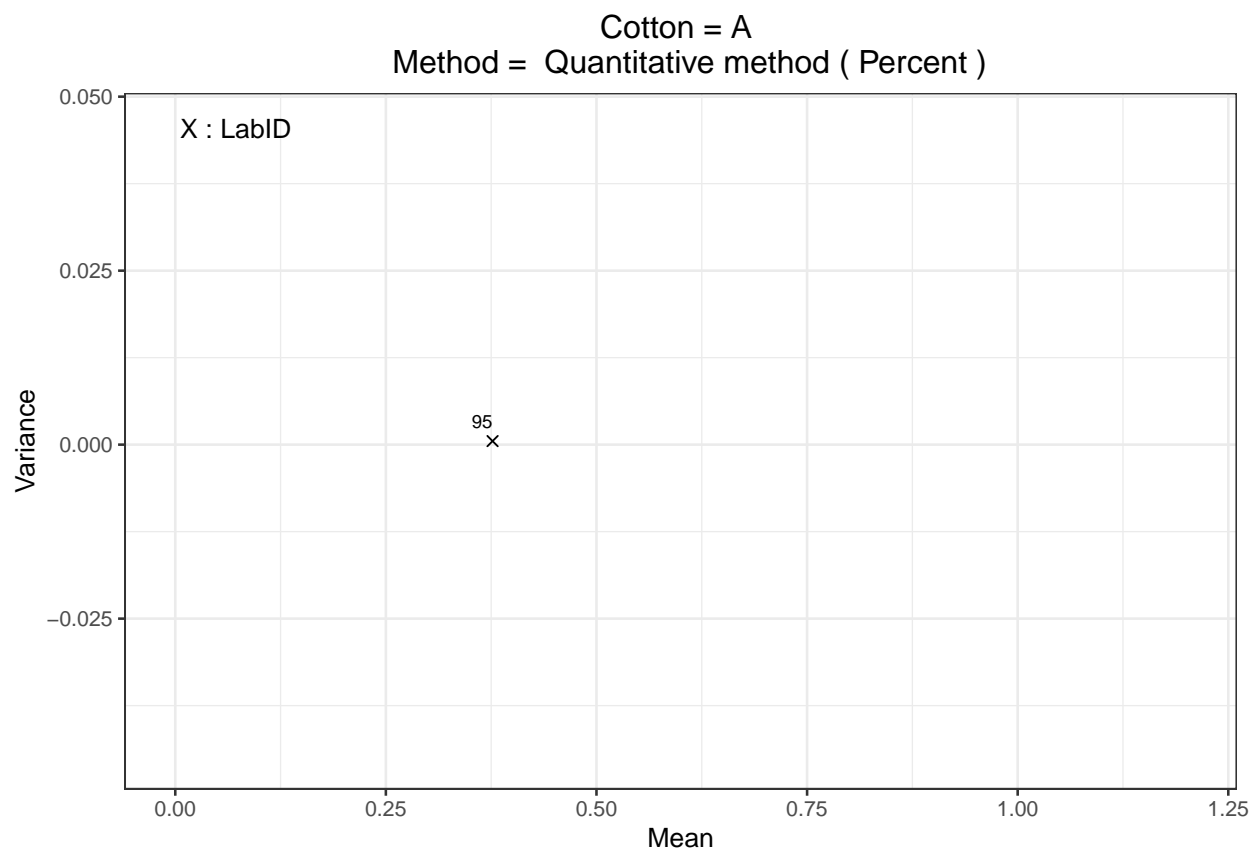




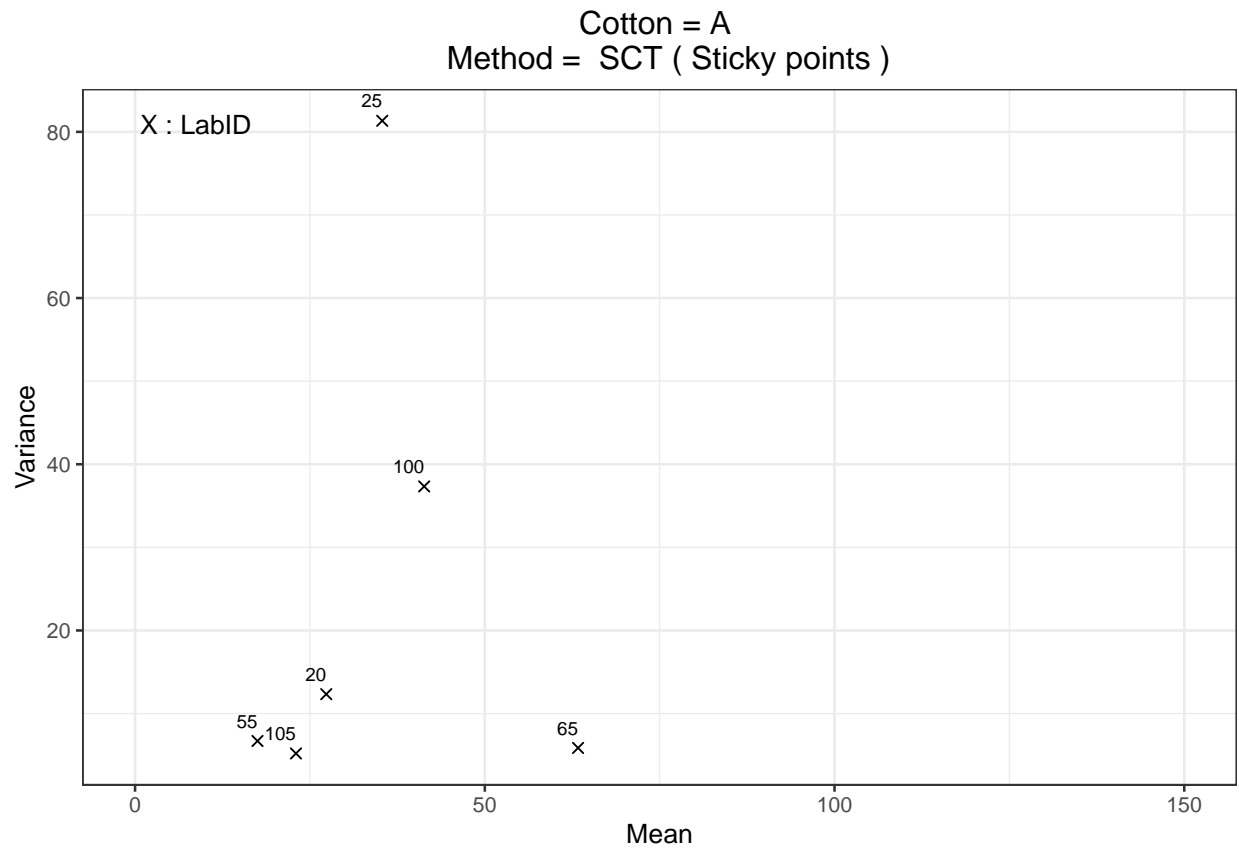
Cotton = A  
Method = Minicard ( ITMF Grade )



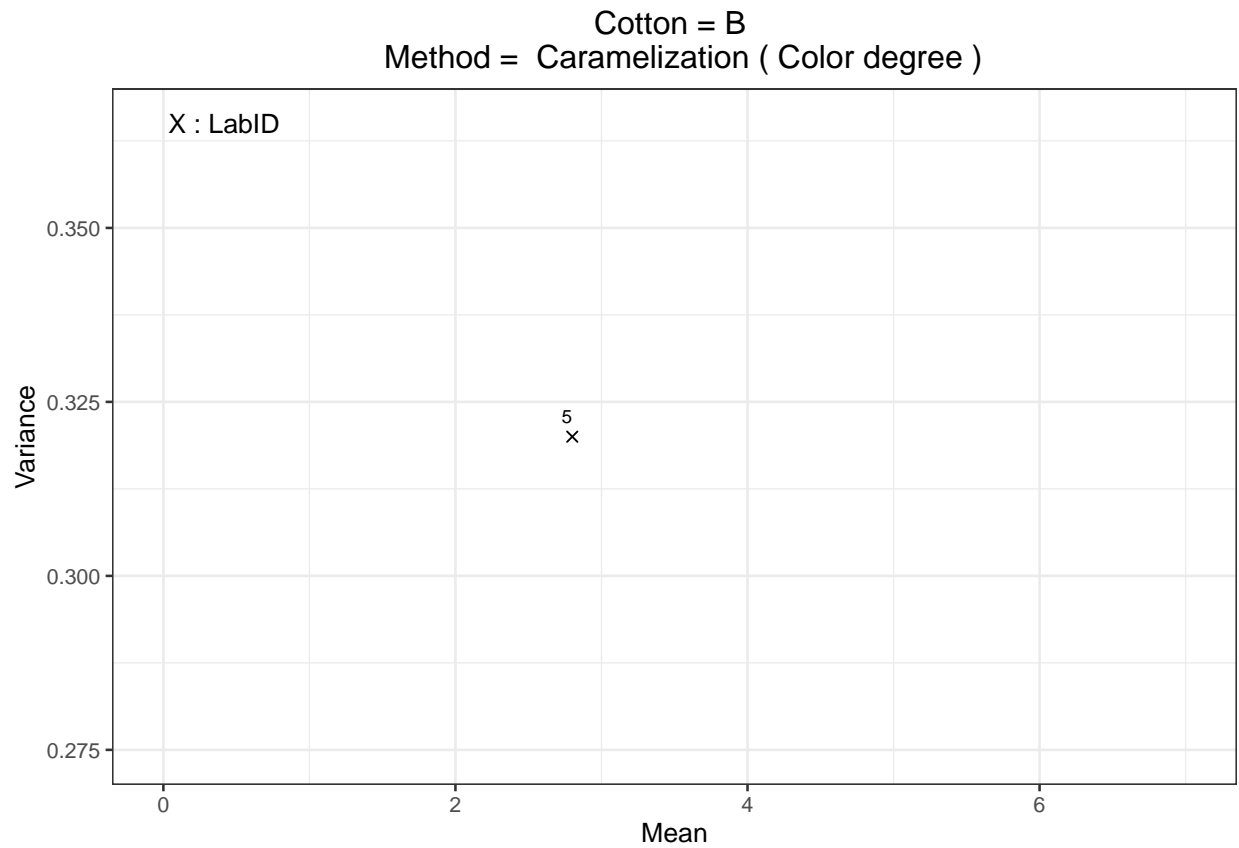




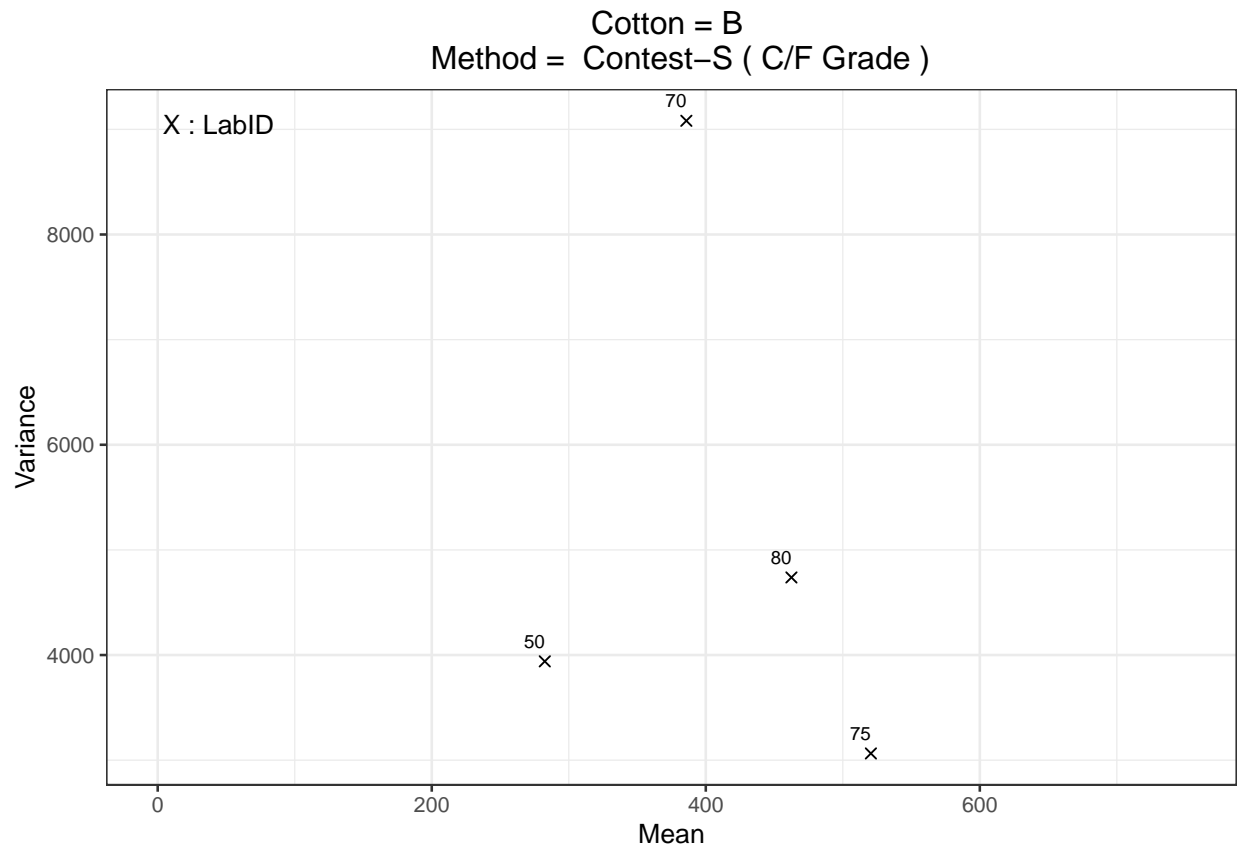




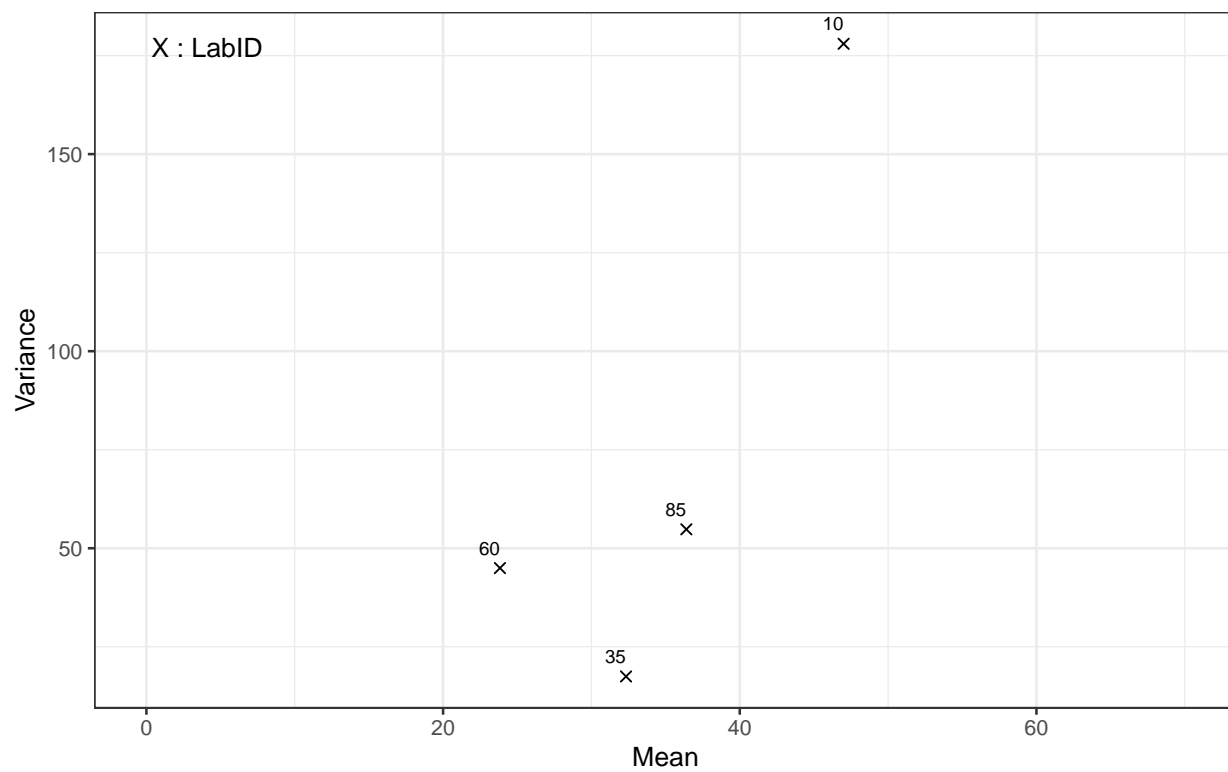
Cotton B : Variance between individual measurements =  $f(\text{Mean})$  for all concerned labs

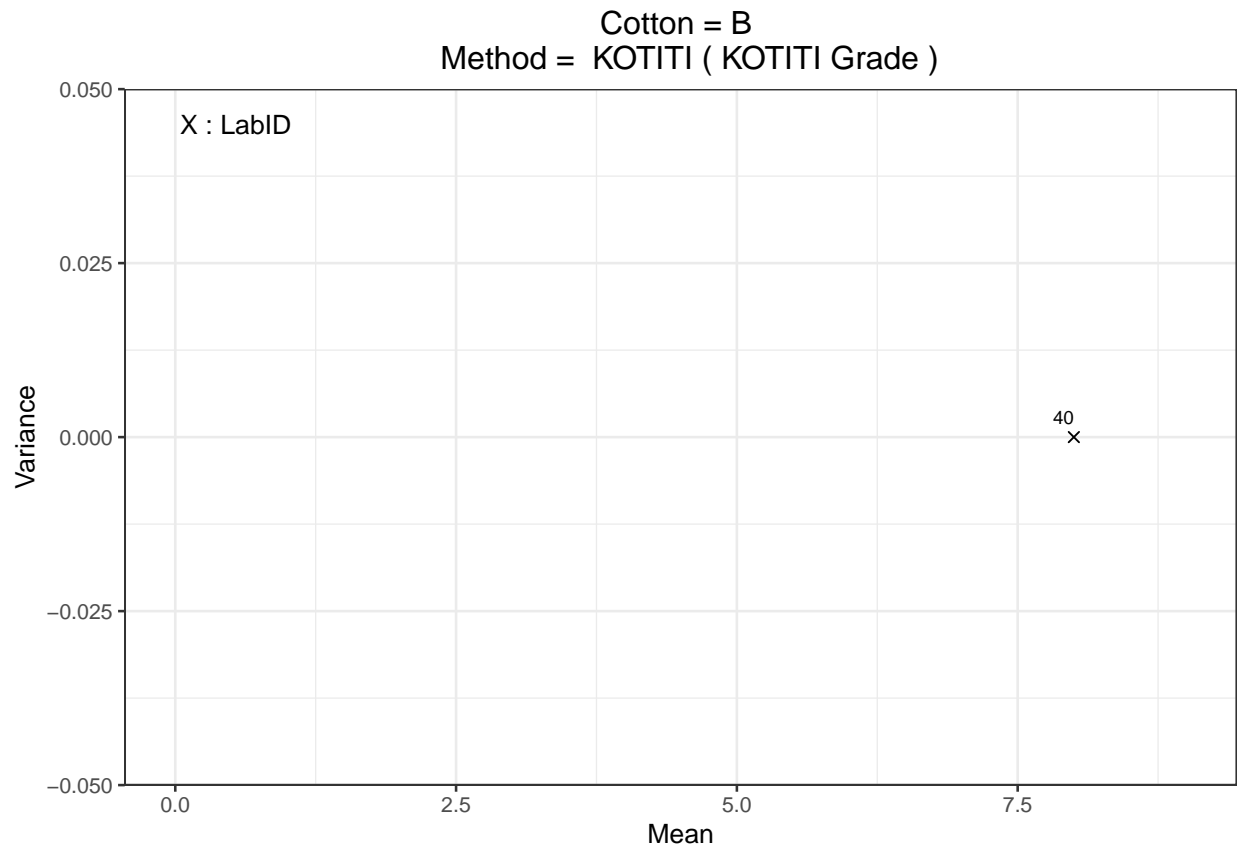


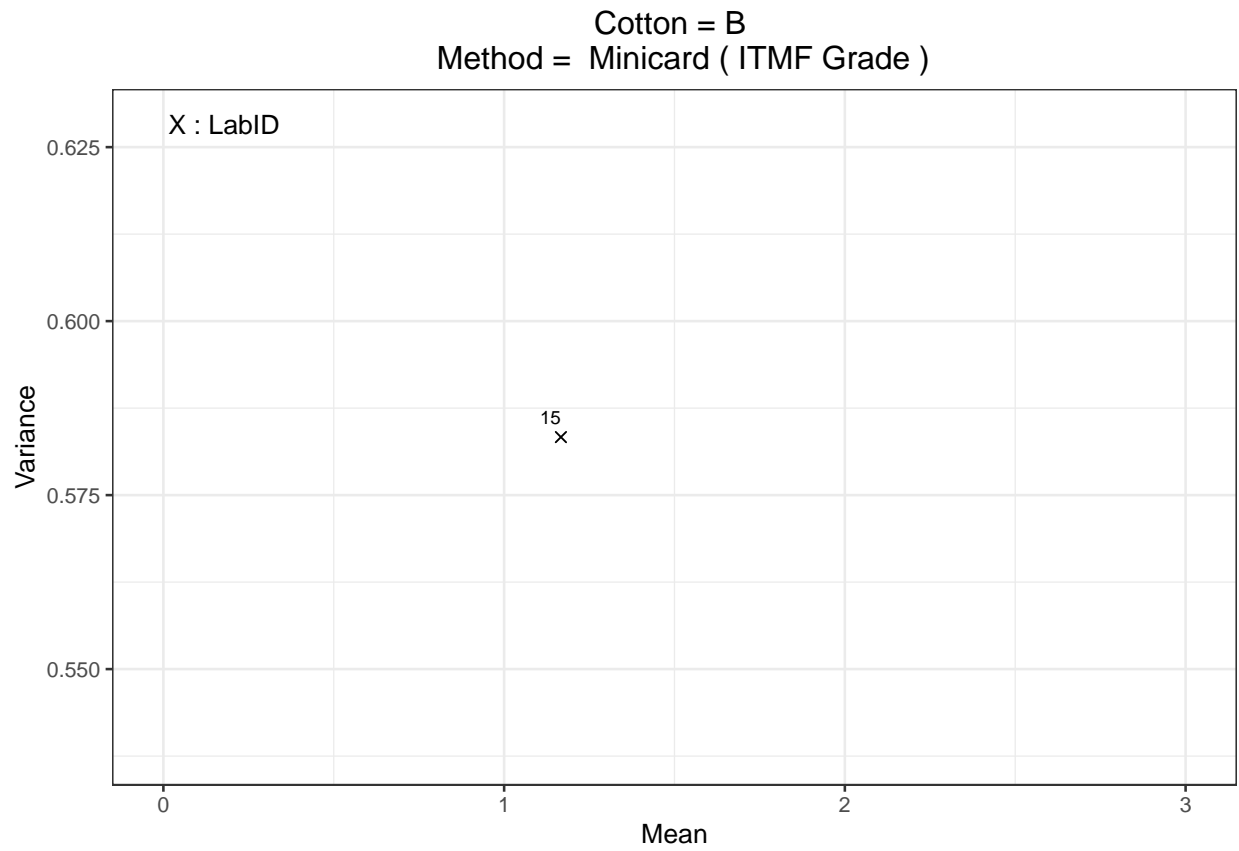
[1] “For Cotton = B and for method = Caramelization , 2 LabID (LabID being , 30, 45) cannot be shown on this chart as only one measurement was performed and, therefore, a variance cannot be calculated in this case.”

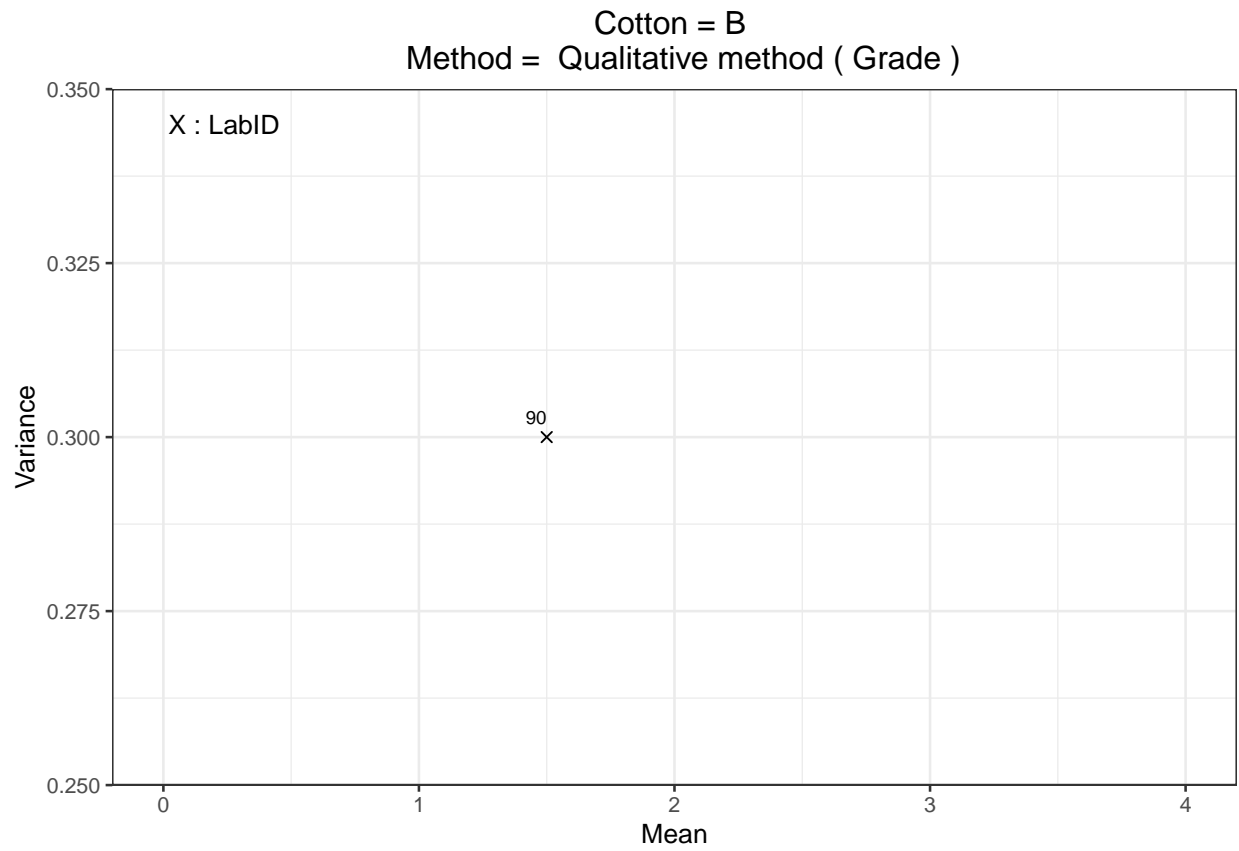


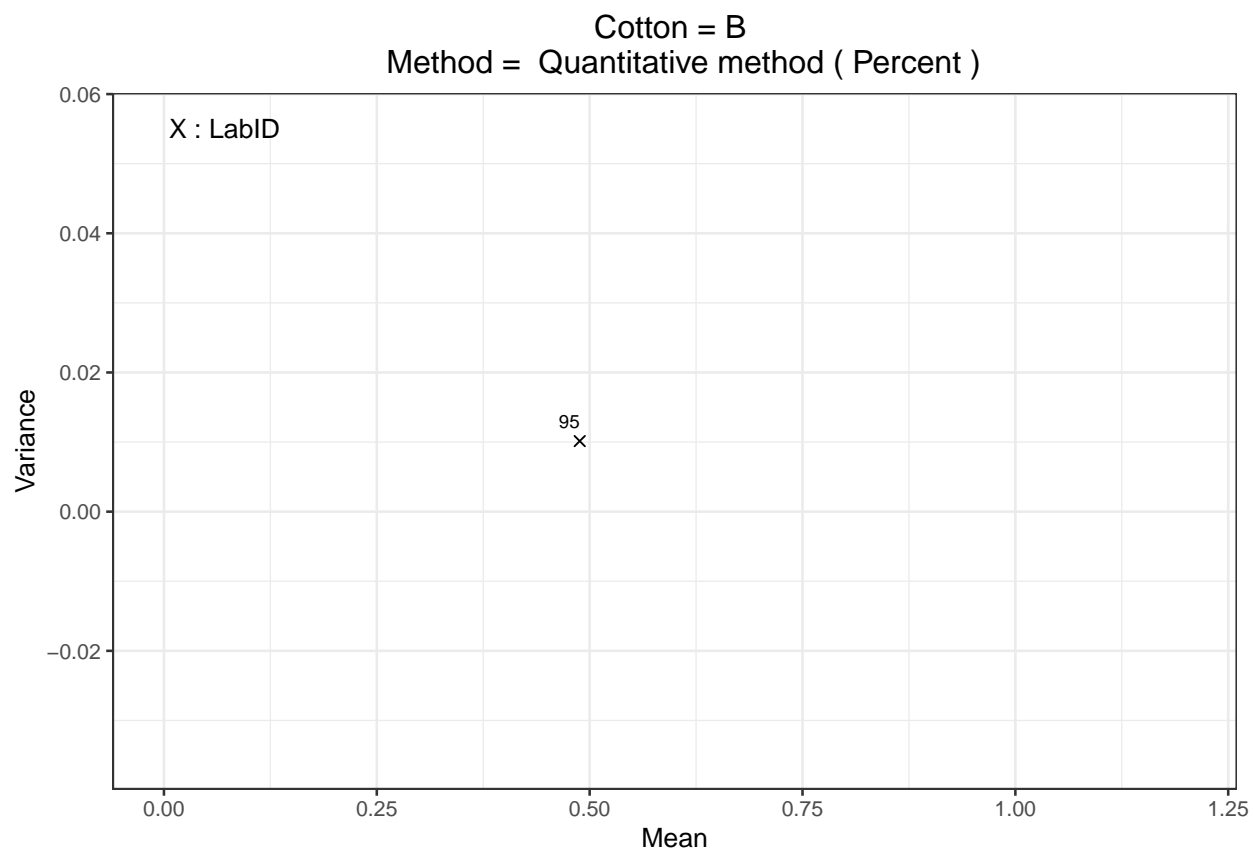
Cotton = B  
Method = H2SD ( Sticky points )



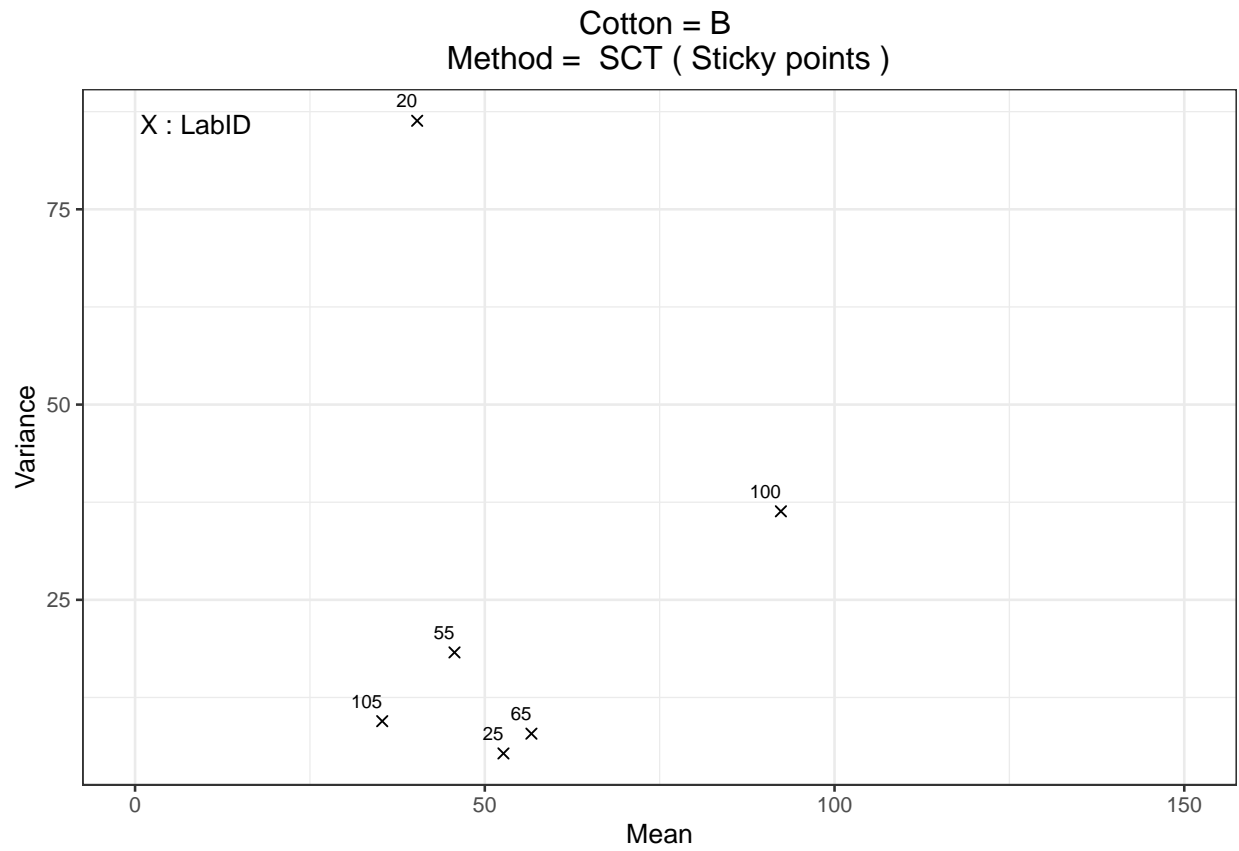




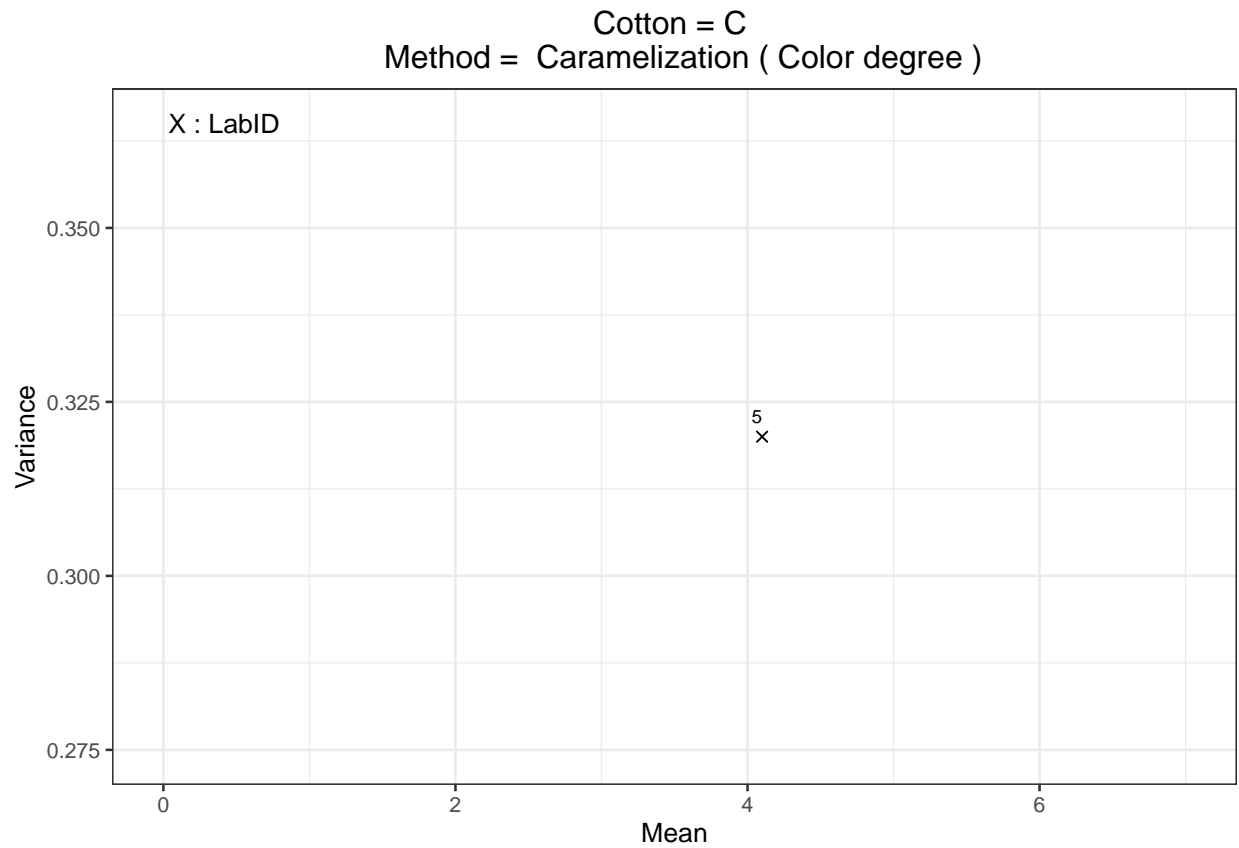






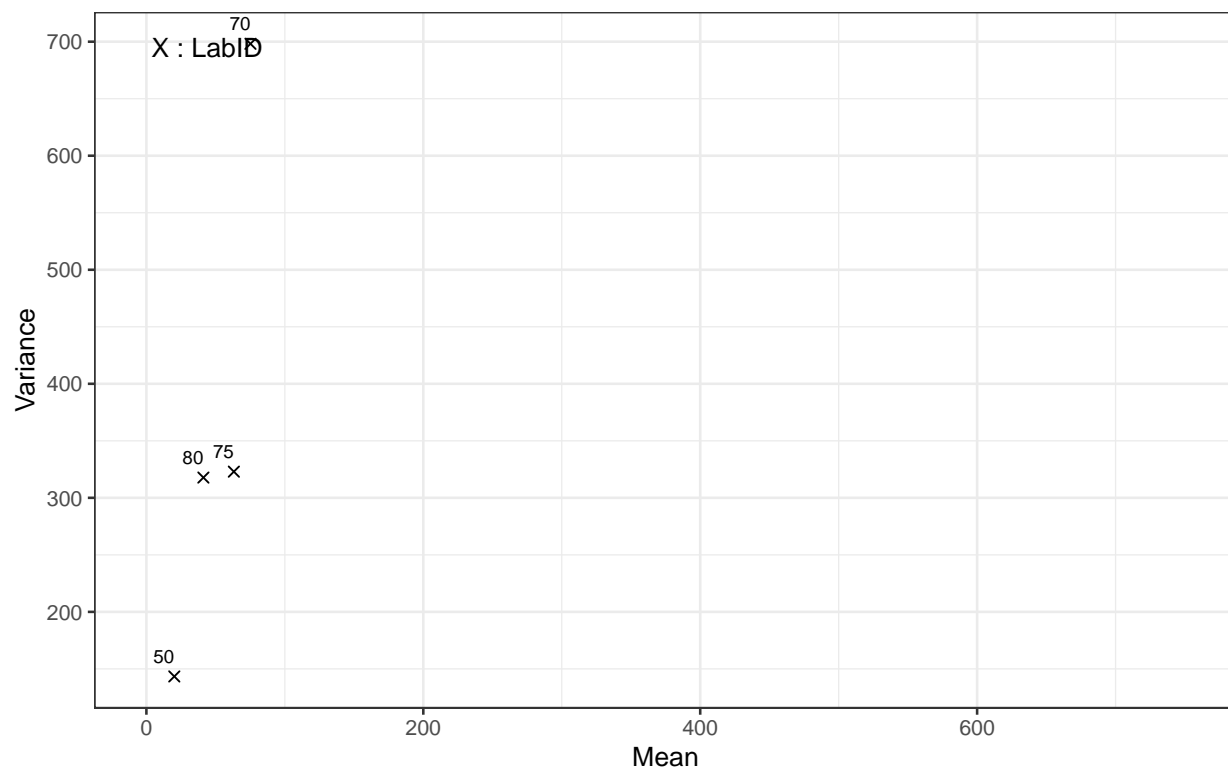


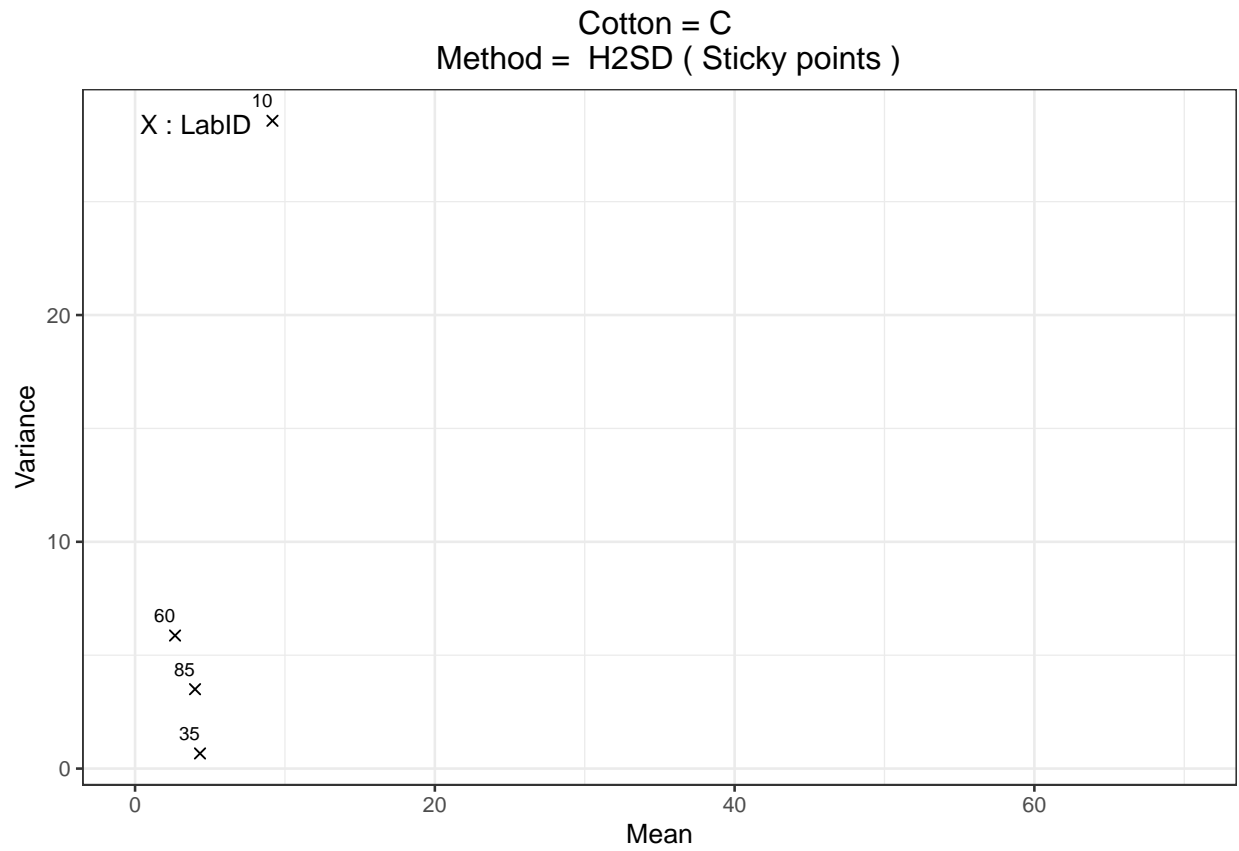
Cotton C : Variance between individual measurements =  $f(\text{Mean})$  for all concerned labs

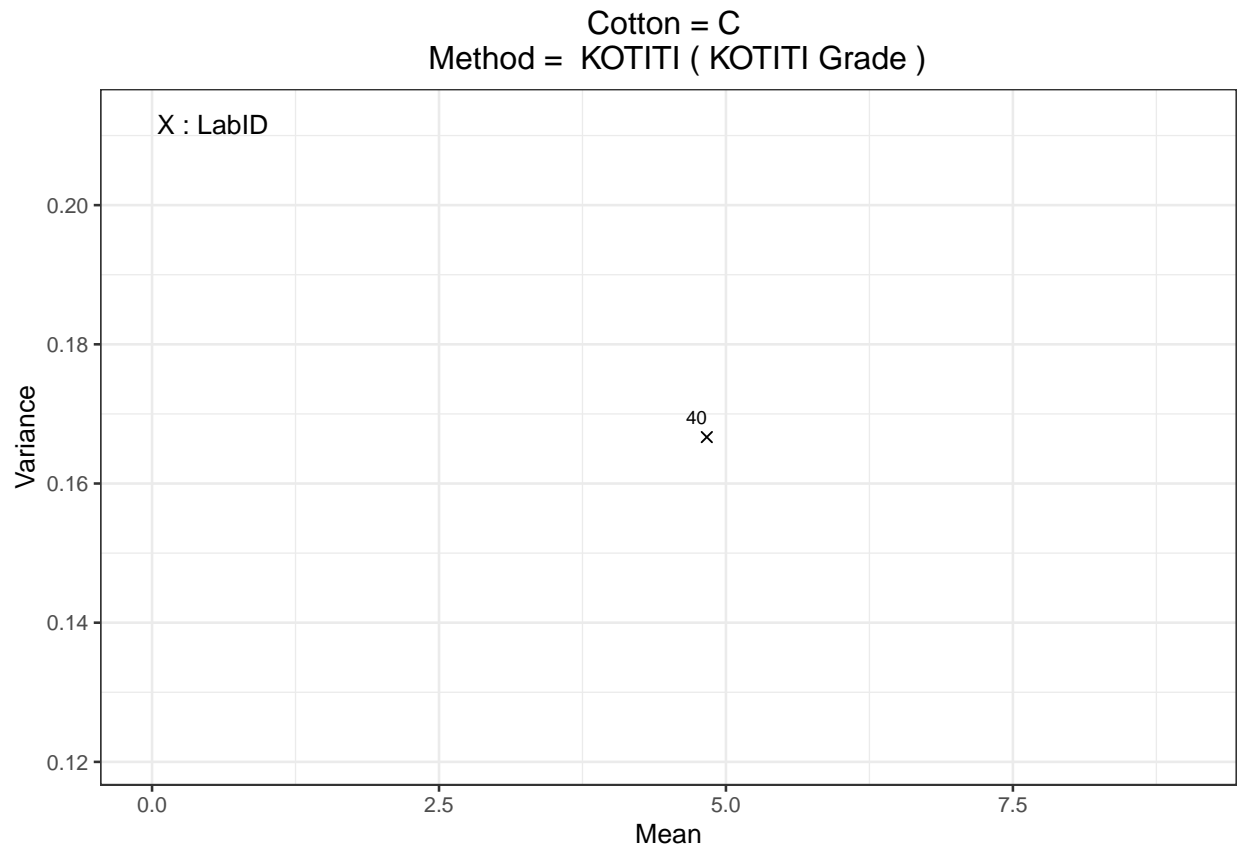


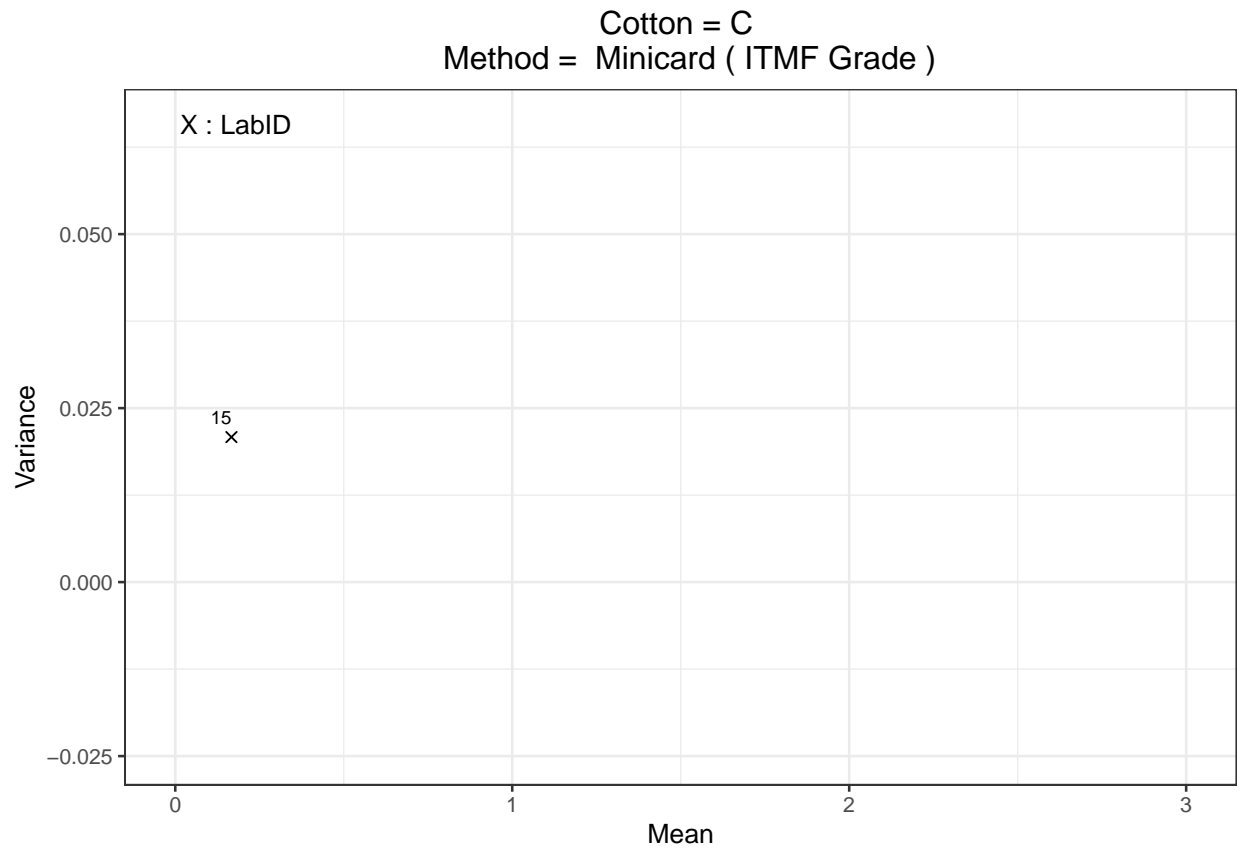
[1] “For Cotton = C and for method = Caramelization , 2 LabID (LabID being , 30, 45) cannot be shown on this chart as only one measurement was performed and, therefore, a variance cannot be calculated in this case.”

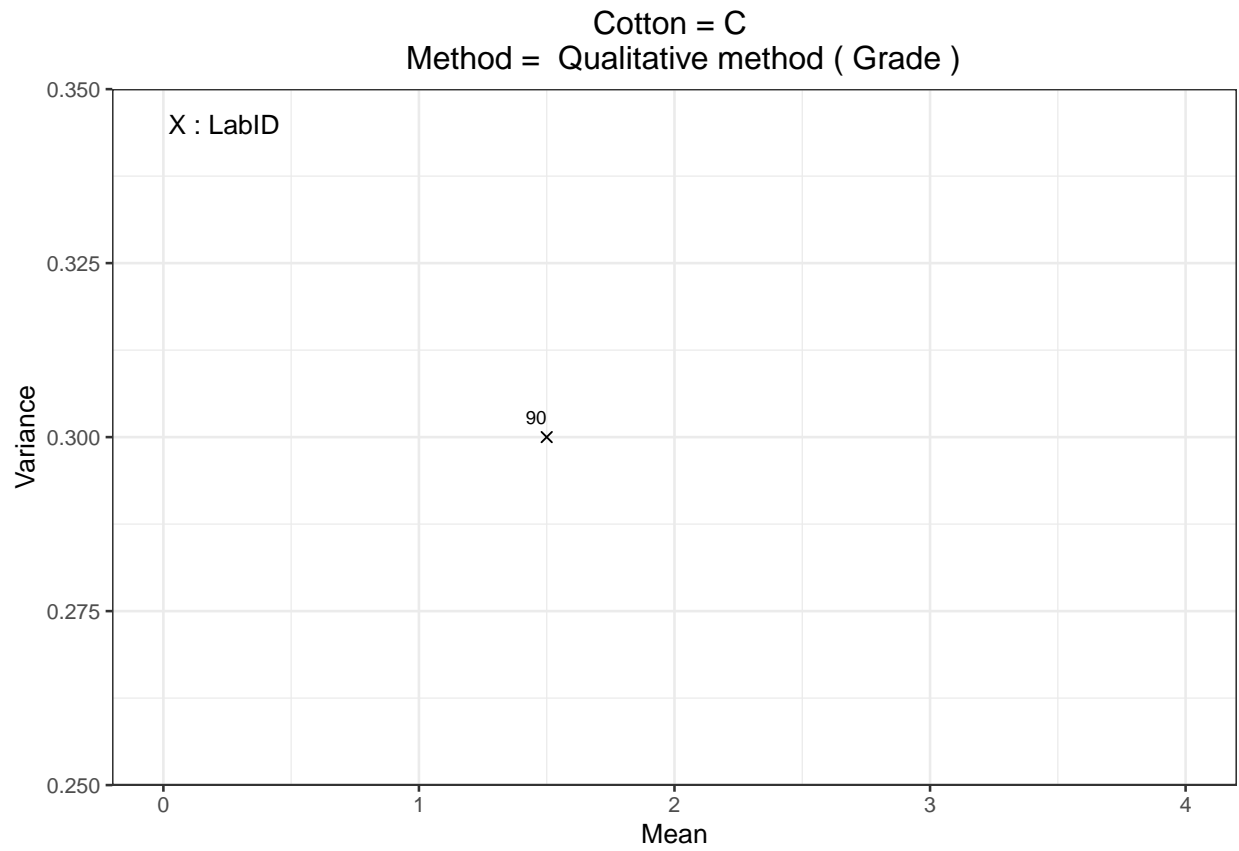
Cotton = C  
Method = Contest-S ( C/F Grade )

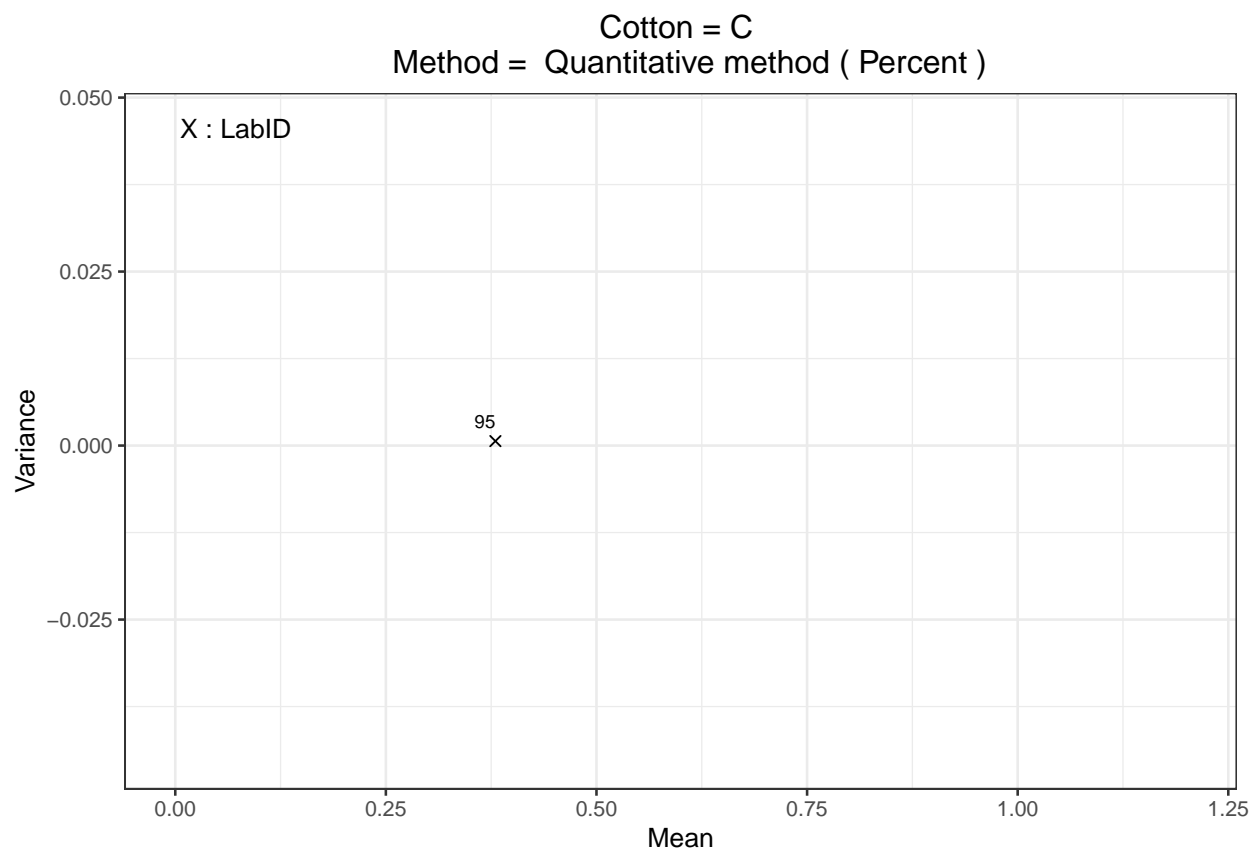




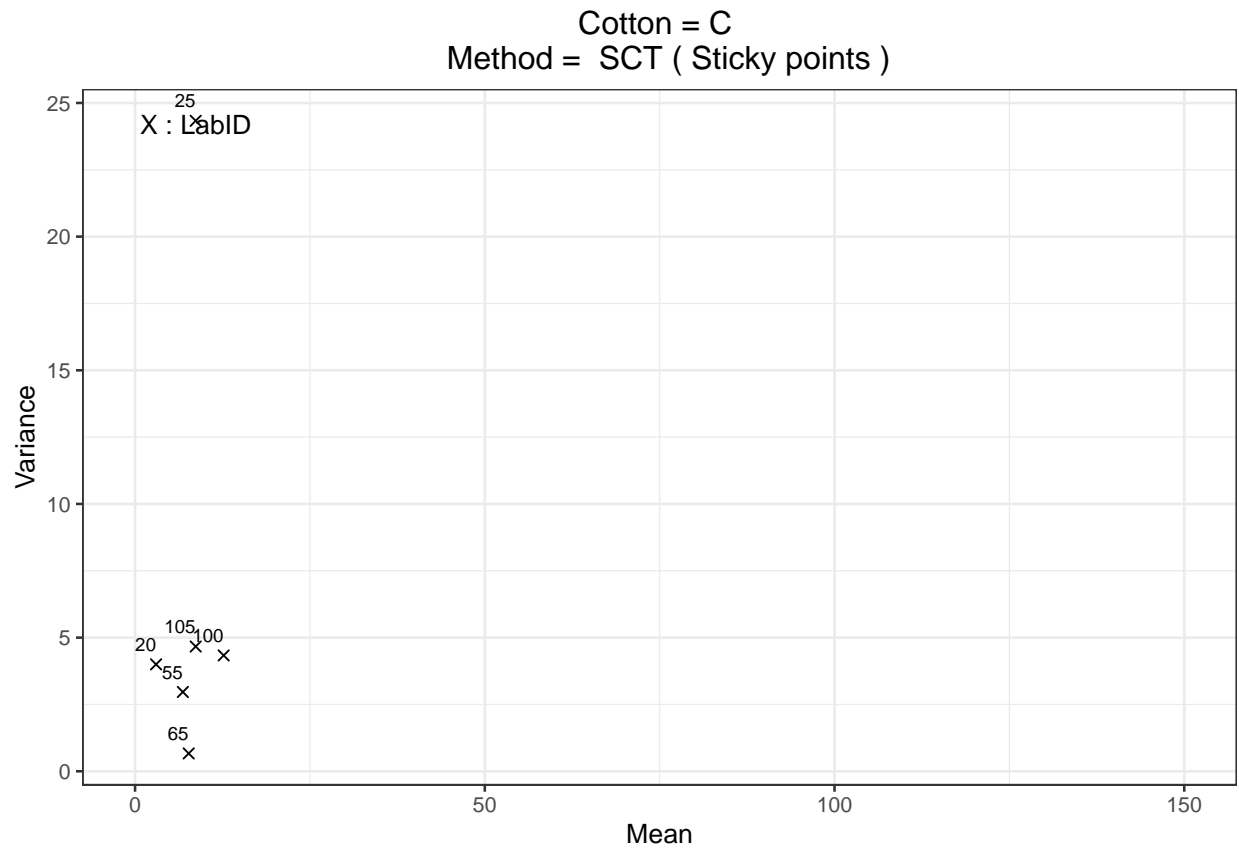




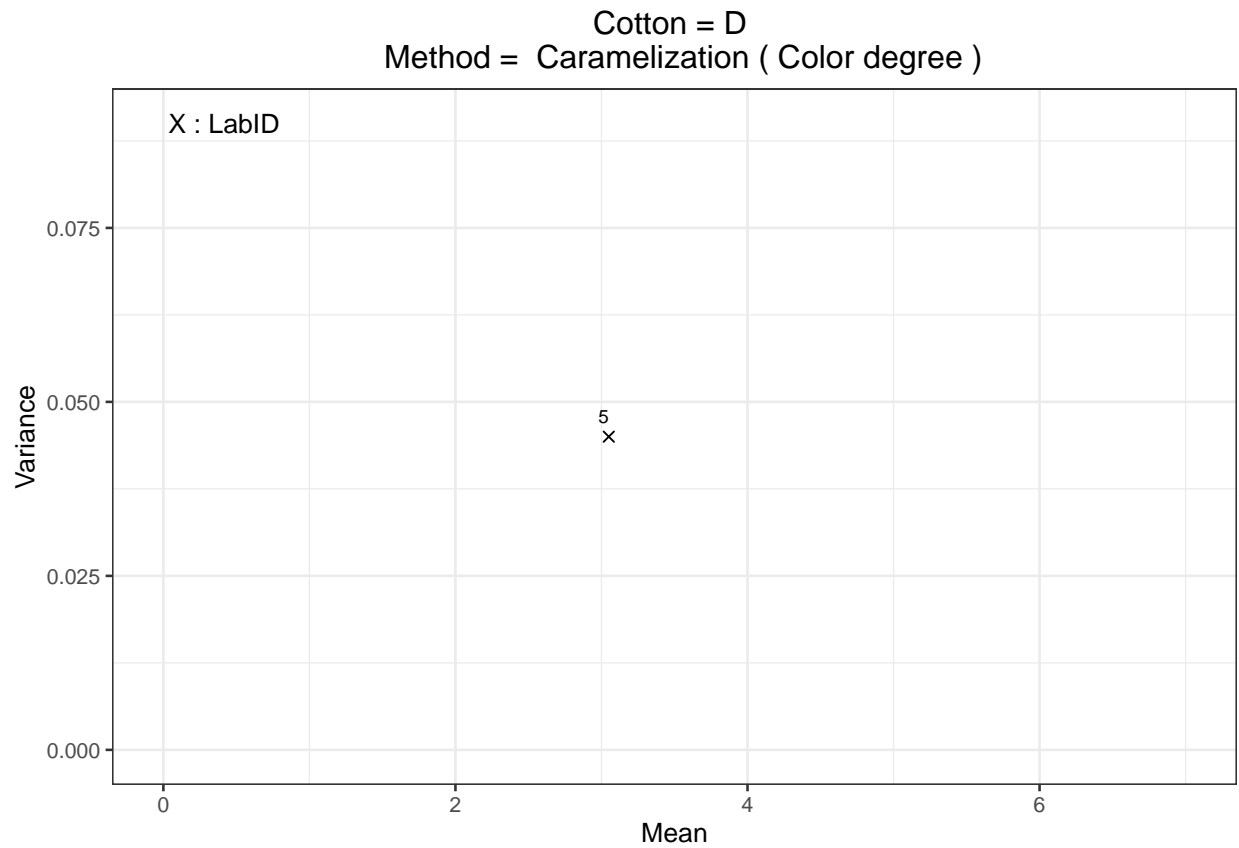




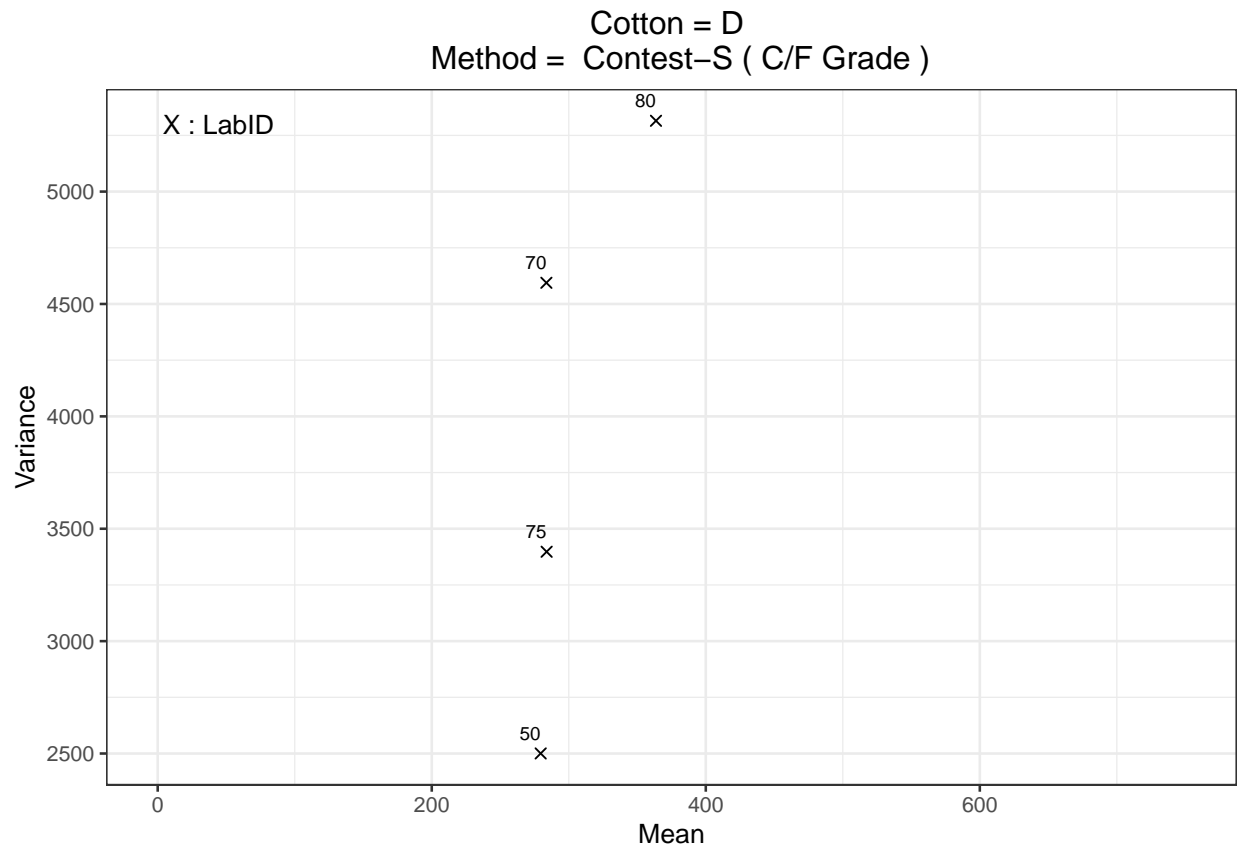


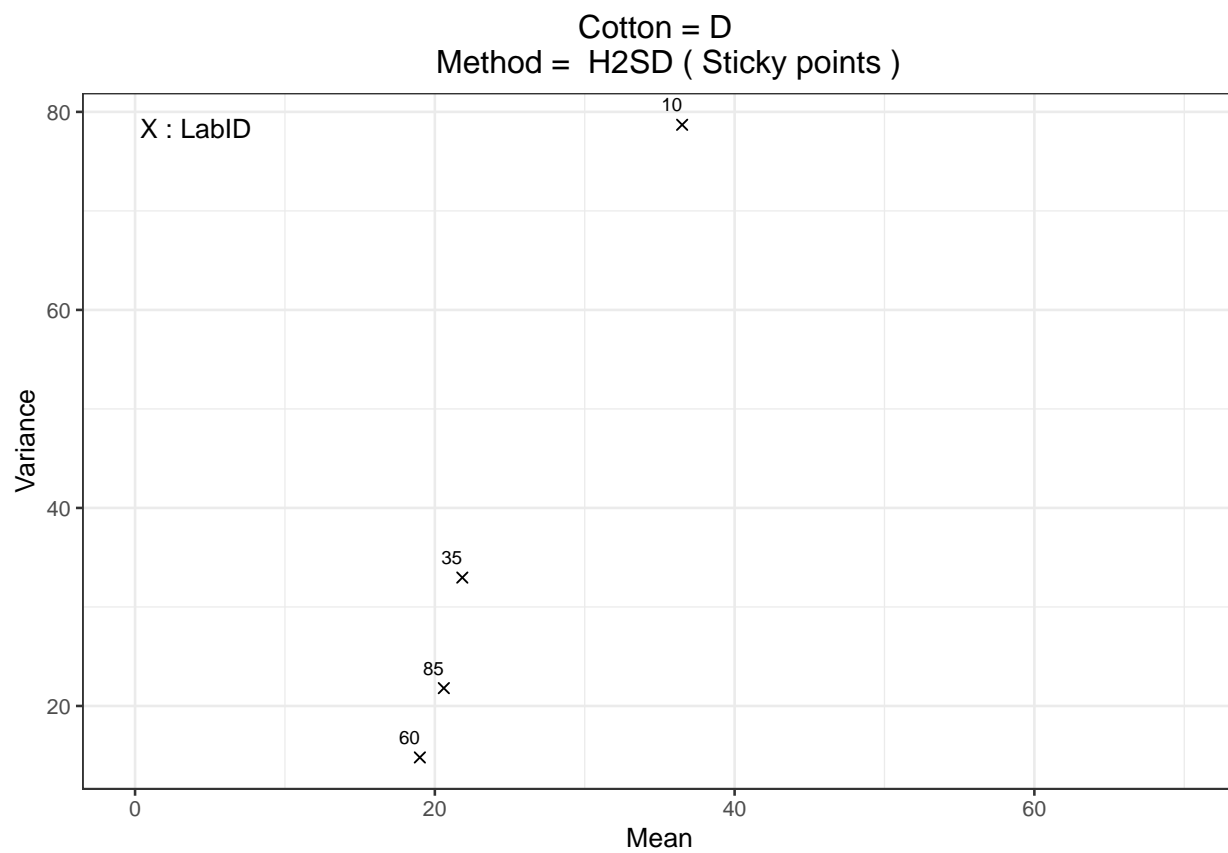


Cotton D : Variance between individual measurements =  $f(\text{Mean})$  for all concerned labs

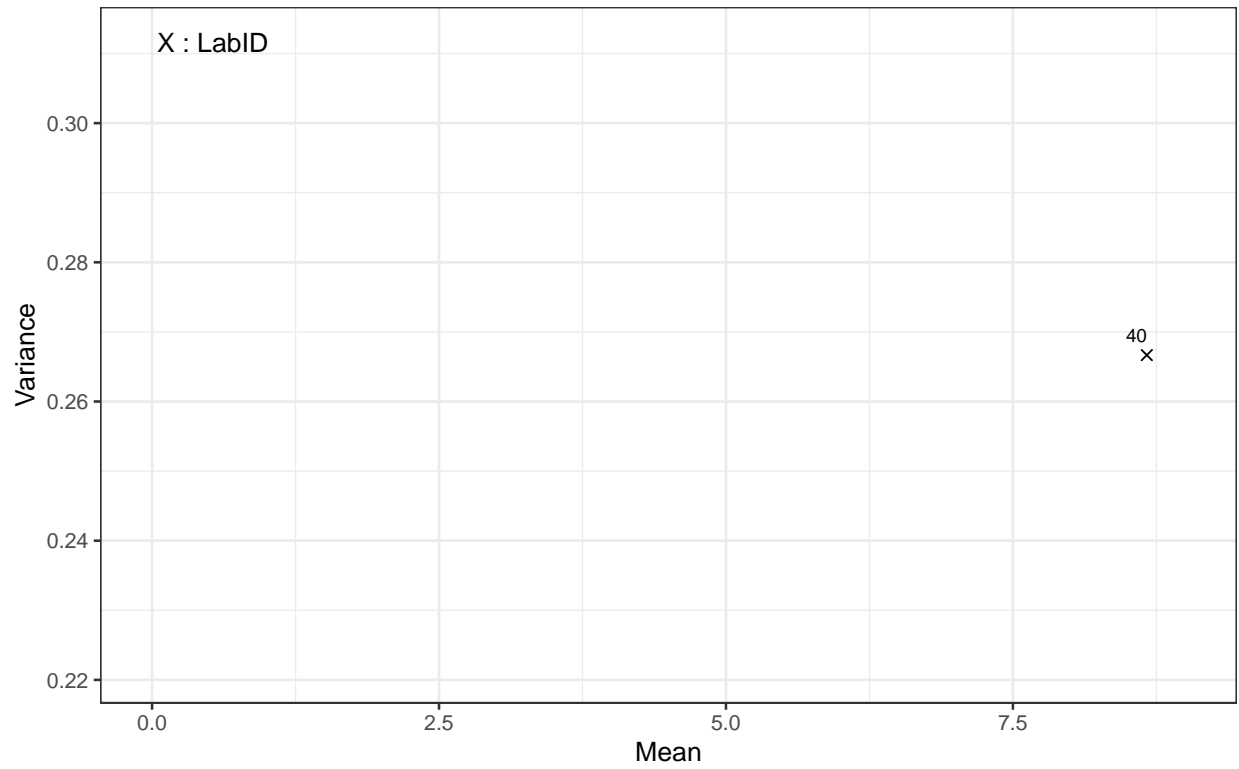


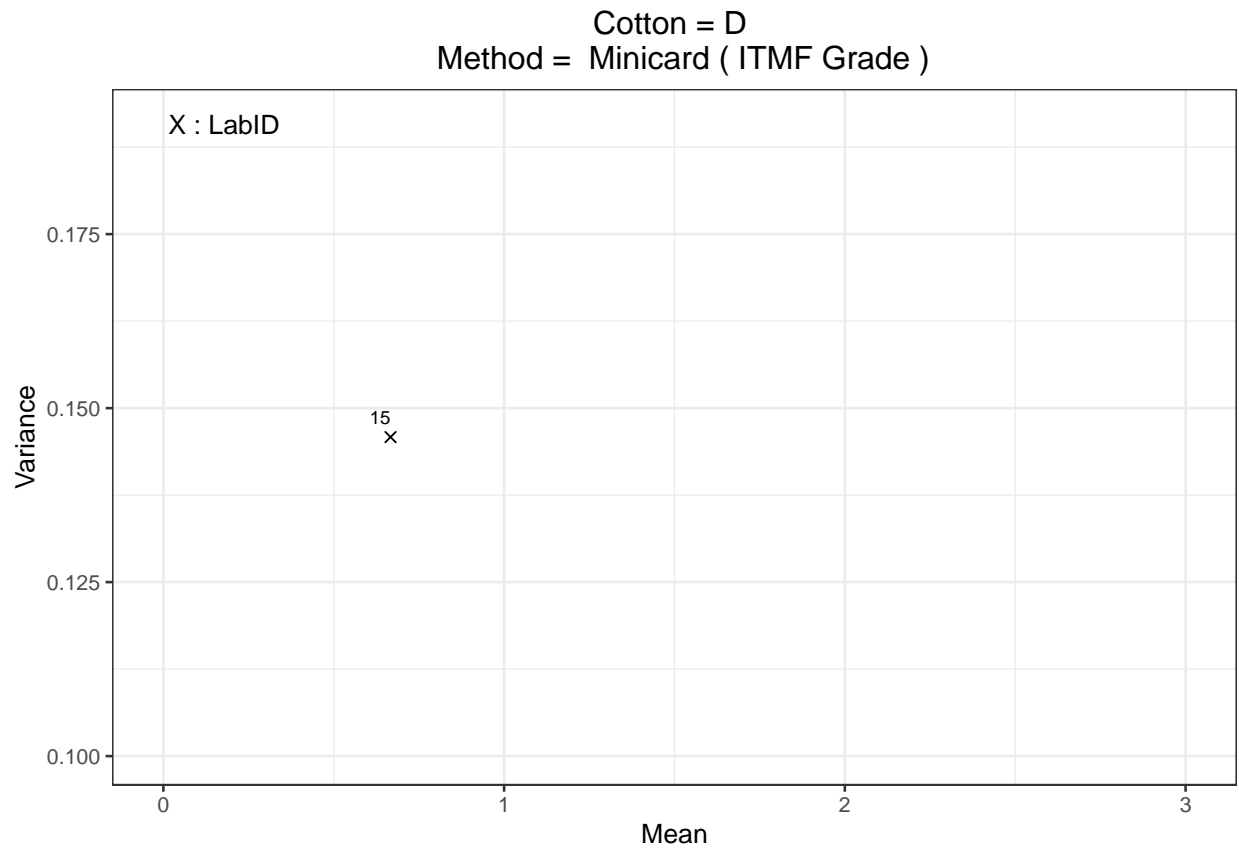
[1] “For Cotton = D and for method = Caramelization , 2 LabID (LabID being , 30, 45) cannot be shown on this chart as only one measurement was performed and, therefore, a variance cannot be calculated in this case.”

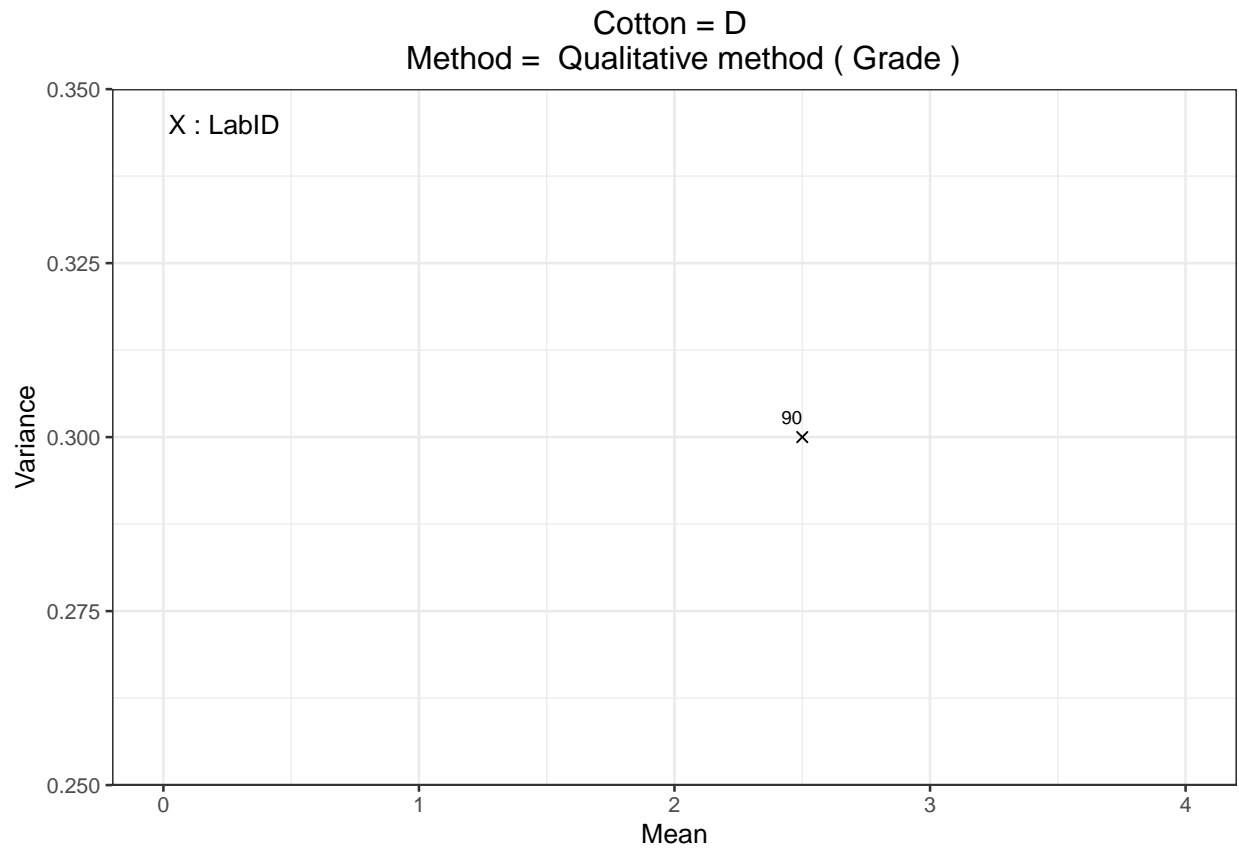


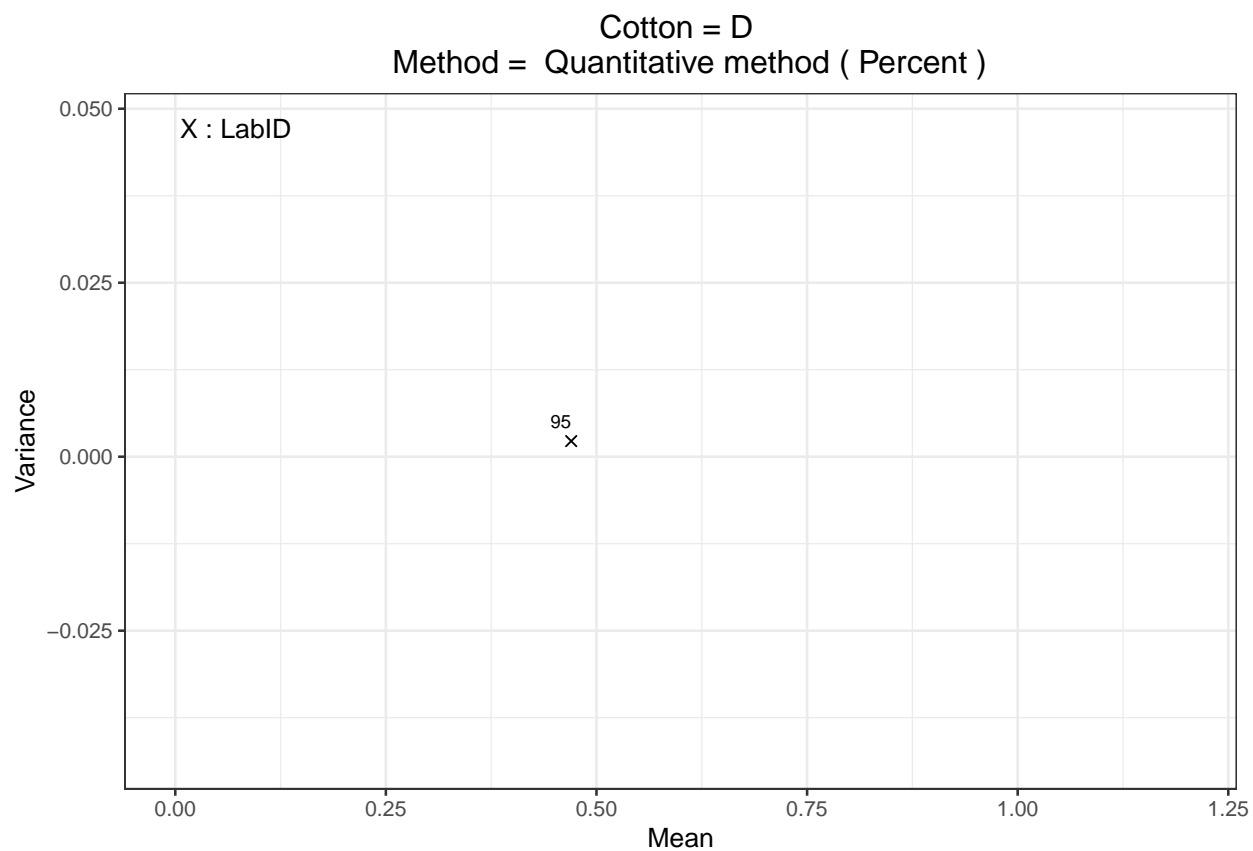


Cotton = D  
Method = KOTITI ( KOTITI Grade )

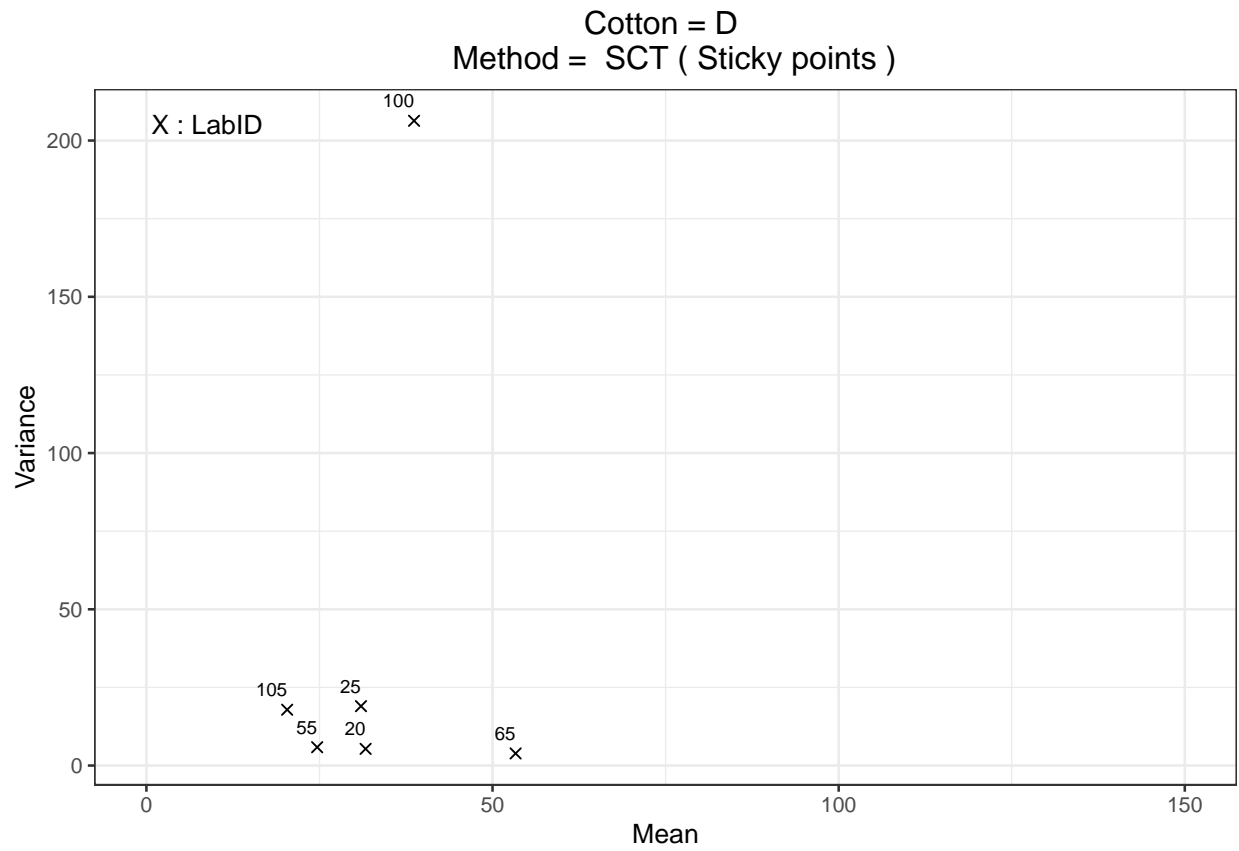




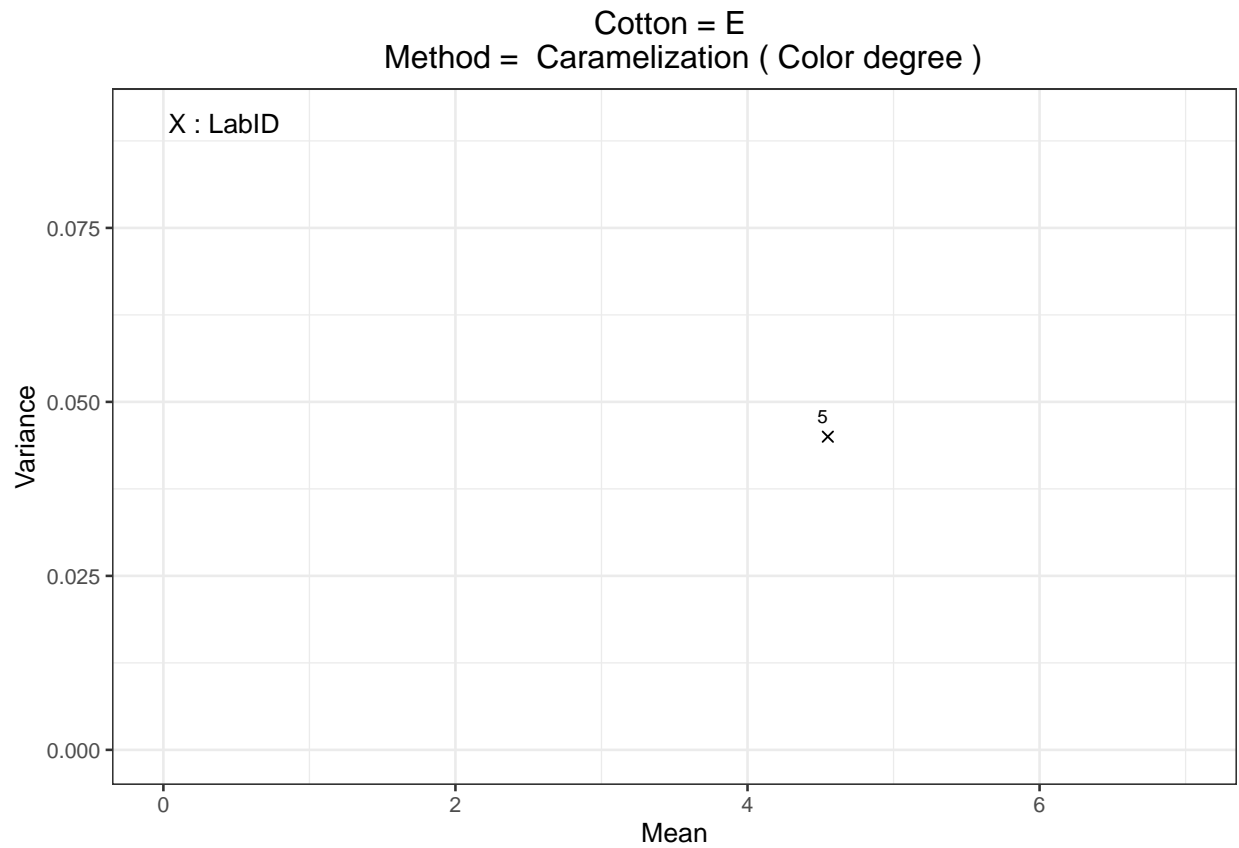






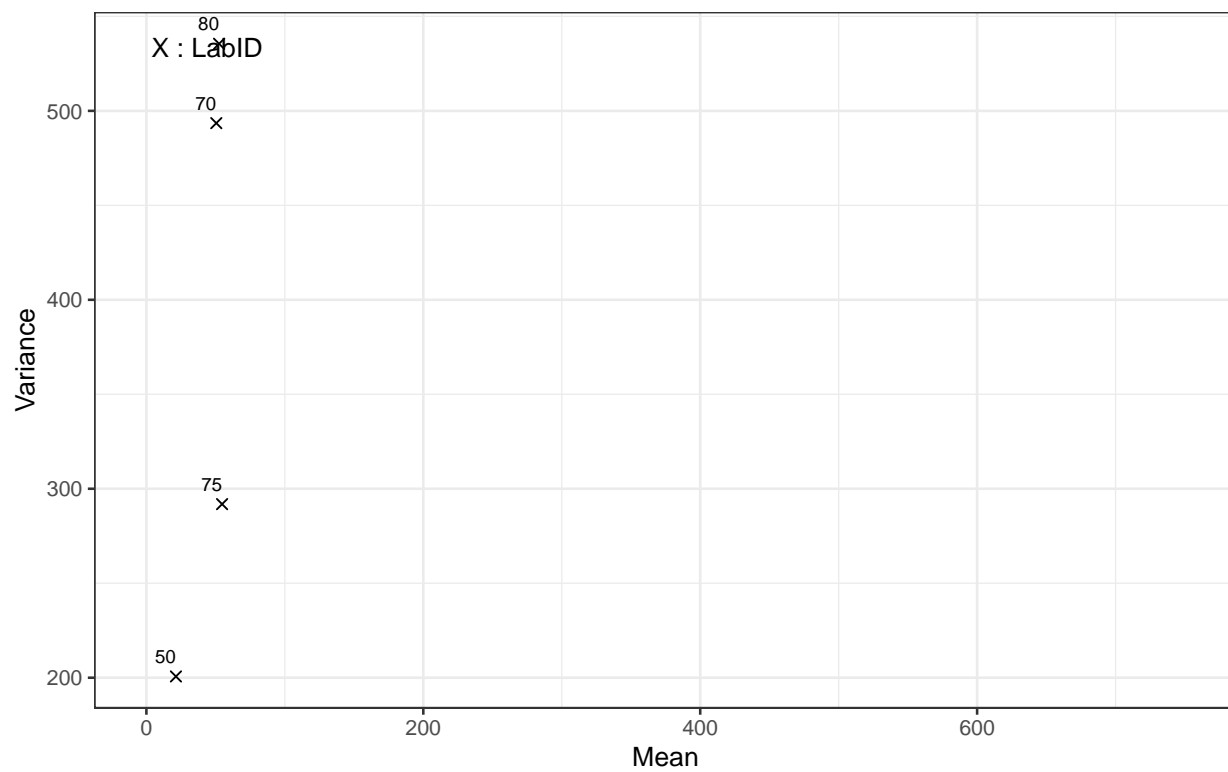


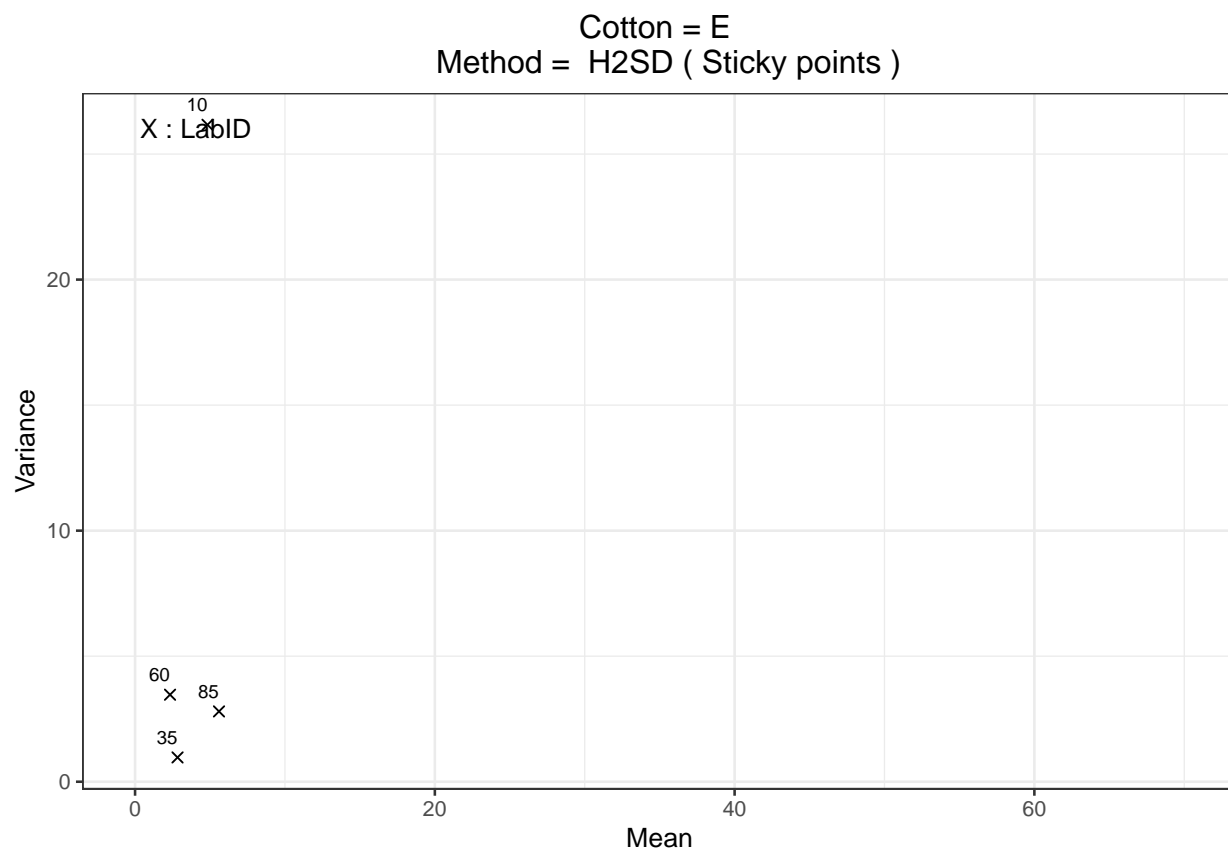
**Cotton E : Variance between individual measurements = f(Mean) for all concerned labs**



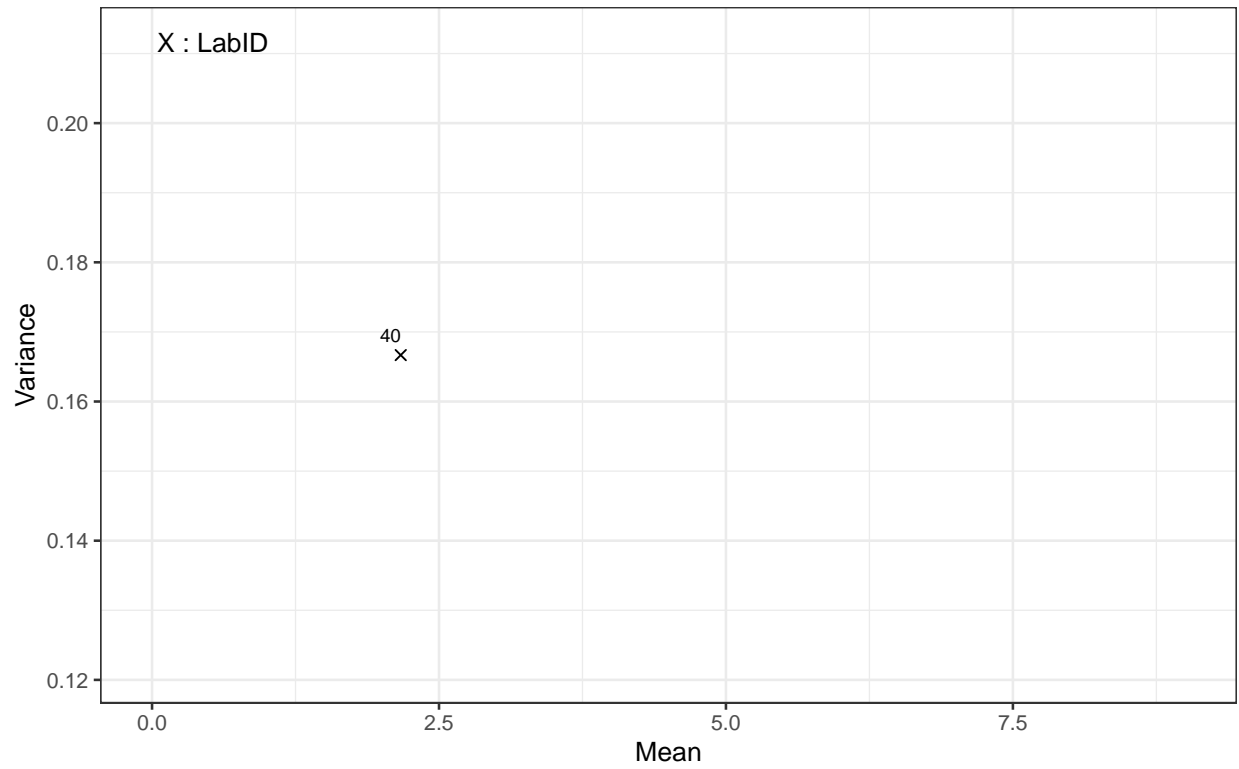
[1] “For Cotton = E and for method = Caramelization , 2 LabID (LabID being , 30, 45) cannot be shown on this chart as only one measurement was performed and, therefore, a variance cannot be calculated in this case.”

Cotton = E  
Method = Contest-S ( C/F Grade )

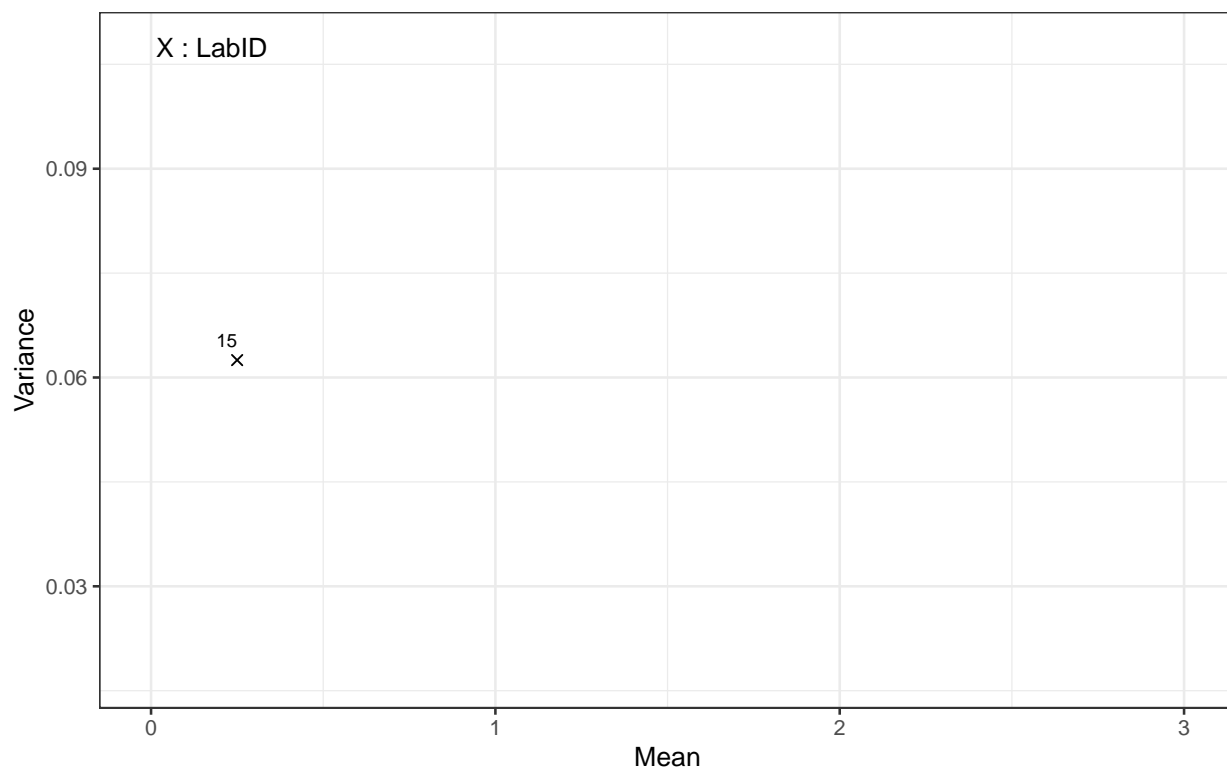


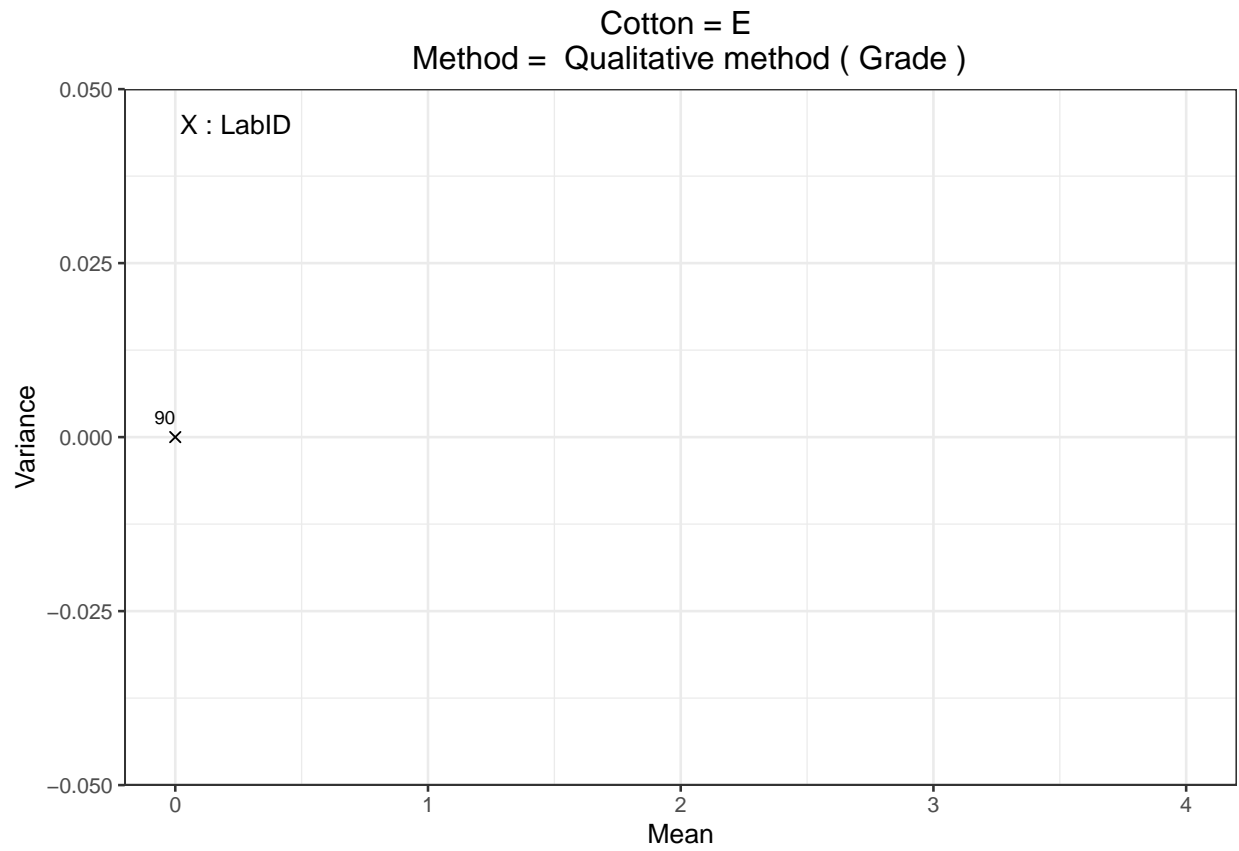


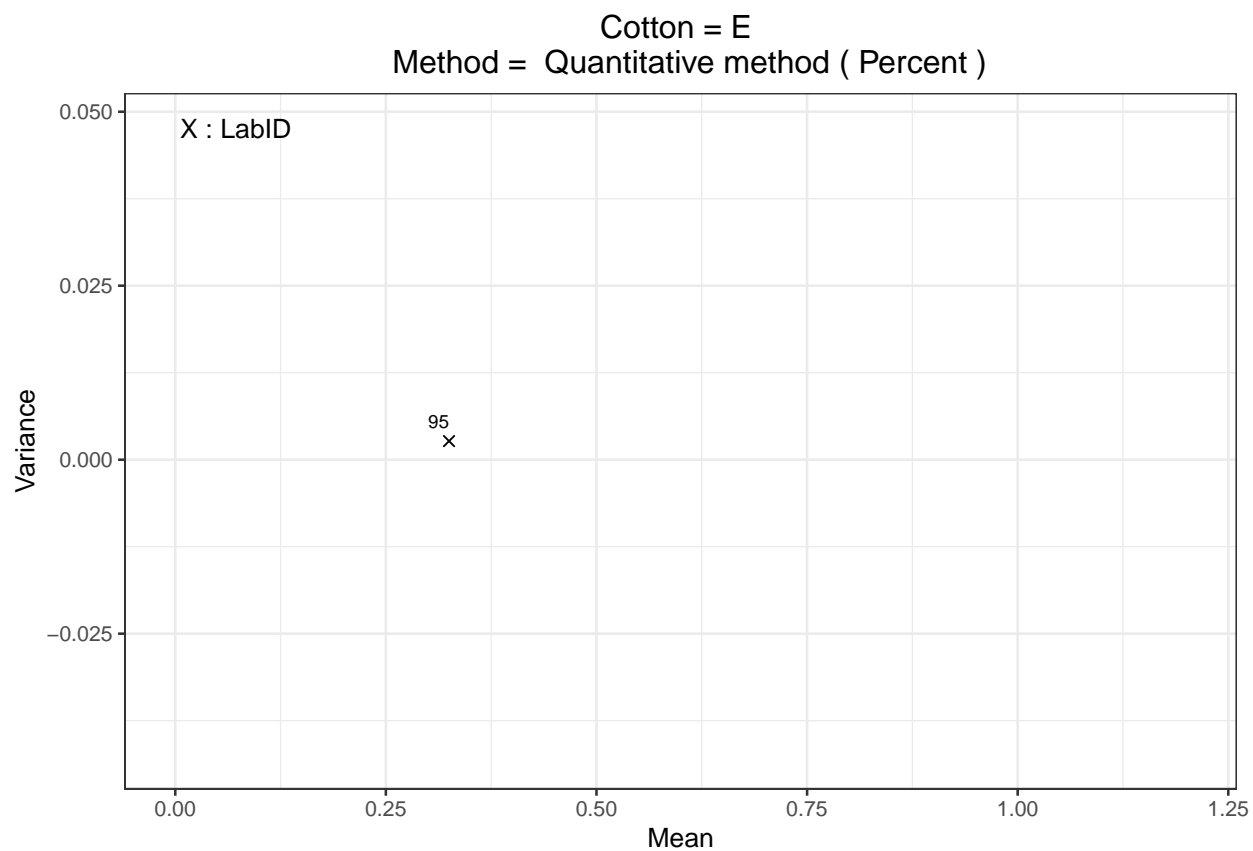
Cotton = E  
Method = KOTITI ( KOTITI Grade )



Cotton = E  
Method = Minicard ( ITMF Grade )

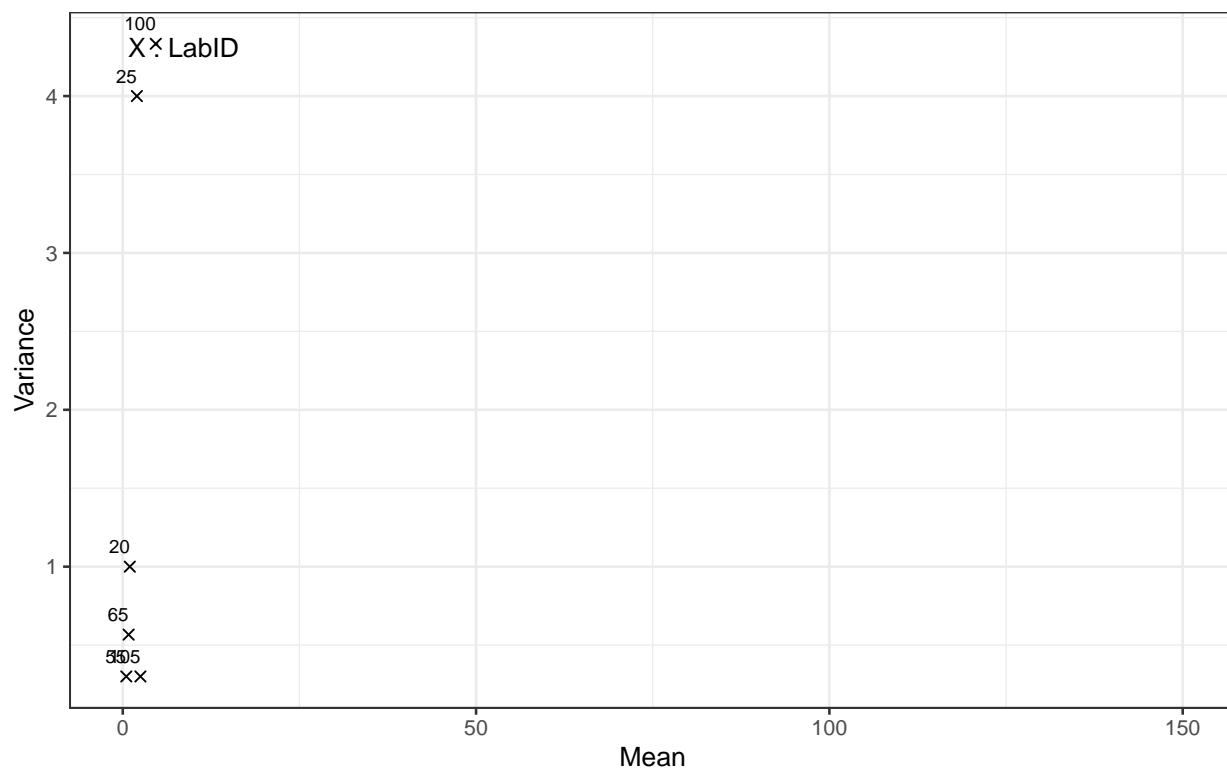








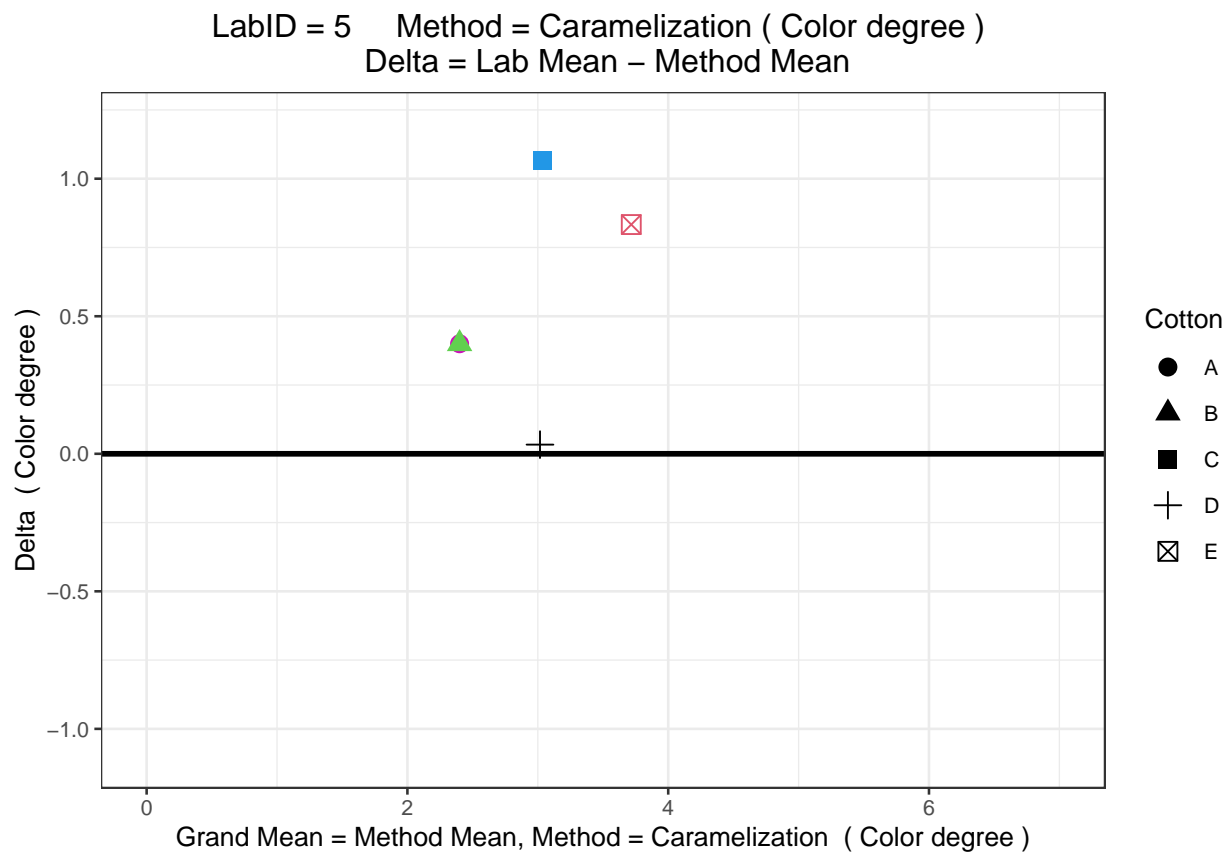
Cotton = E  
Method = SCT ( Sticky points )



## CSITC type charts: distance Delta of Lab readings to the Grand Mean by Method and by LabID <sup>6</sup>

This type of chart is devoted to displaying the ability of any Method and any LabID to not deviate from the observed GrandMean of any given characteristic whatever the measured levels of the participating cottons, and then covering the range of stickiness of the participating cottons in this case. If only one LabID is using a given Method, then all Delta points (one point per participating cotton) will be positionned at Delta = 0 (Y axis) and at the GrandMean values of the cottons (X axis). If two labs are using a given Method, then their respective Delta points will be positionned in symetry of the X axis at the respective Delta values (Y axis) and at the GrandMean values of the cottons (on the X axis).

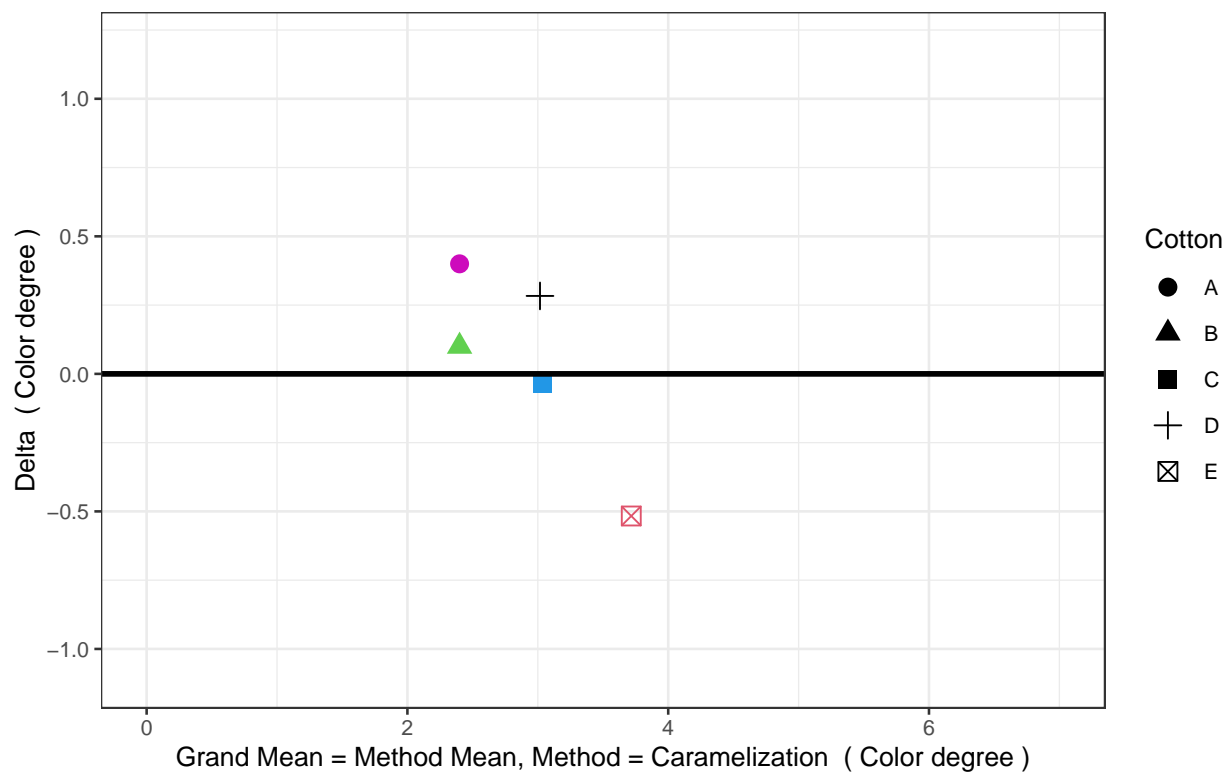
### CSITC type chart for Method Caramelization



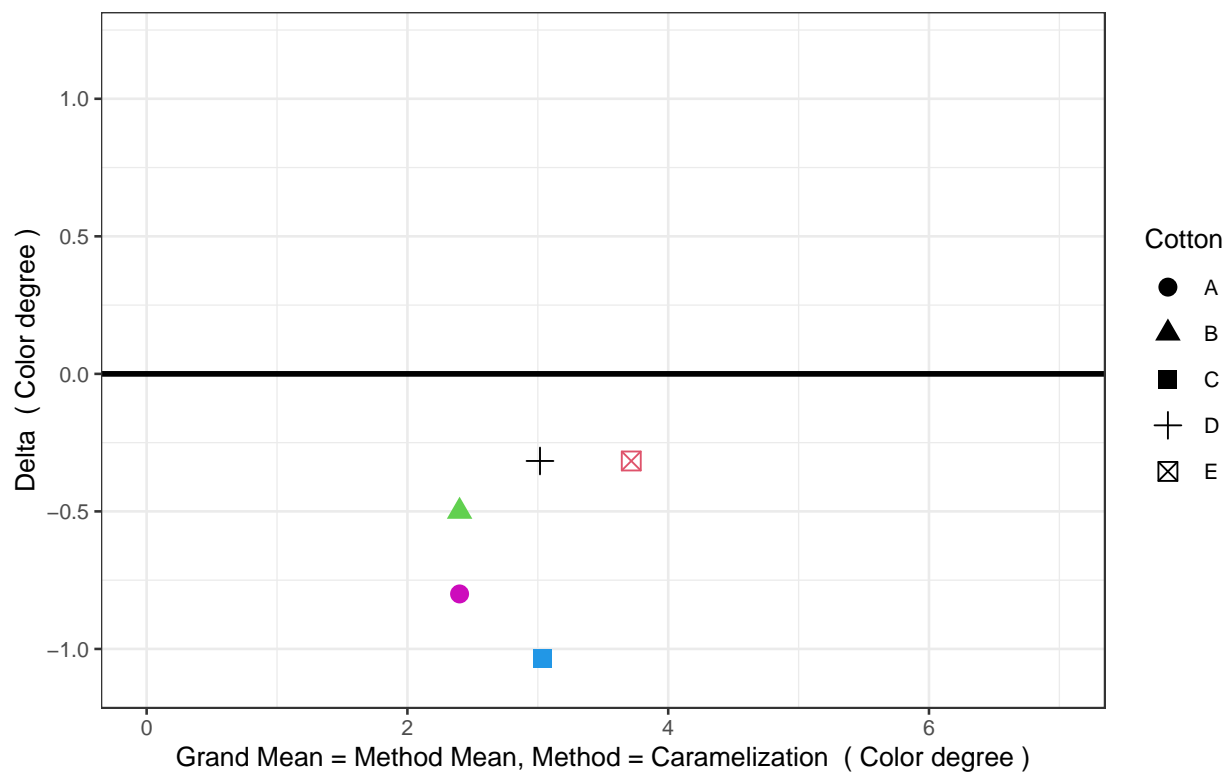
<sup>6</sup>Footnote

\* GMean = Grand Mean of all laboratory means, calculated by Method.  
\* Chart abscissa axis is given in the original individual readings scale.

LabID = 30    Method = Caramelization ( Color degree )  
Delta = Lab Mean – Method Mean



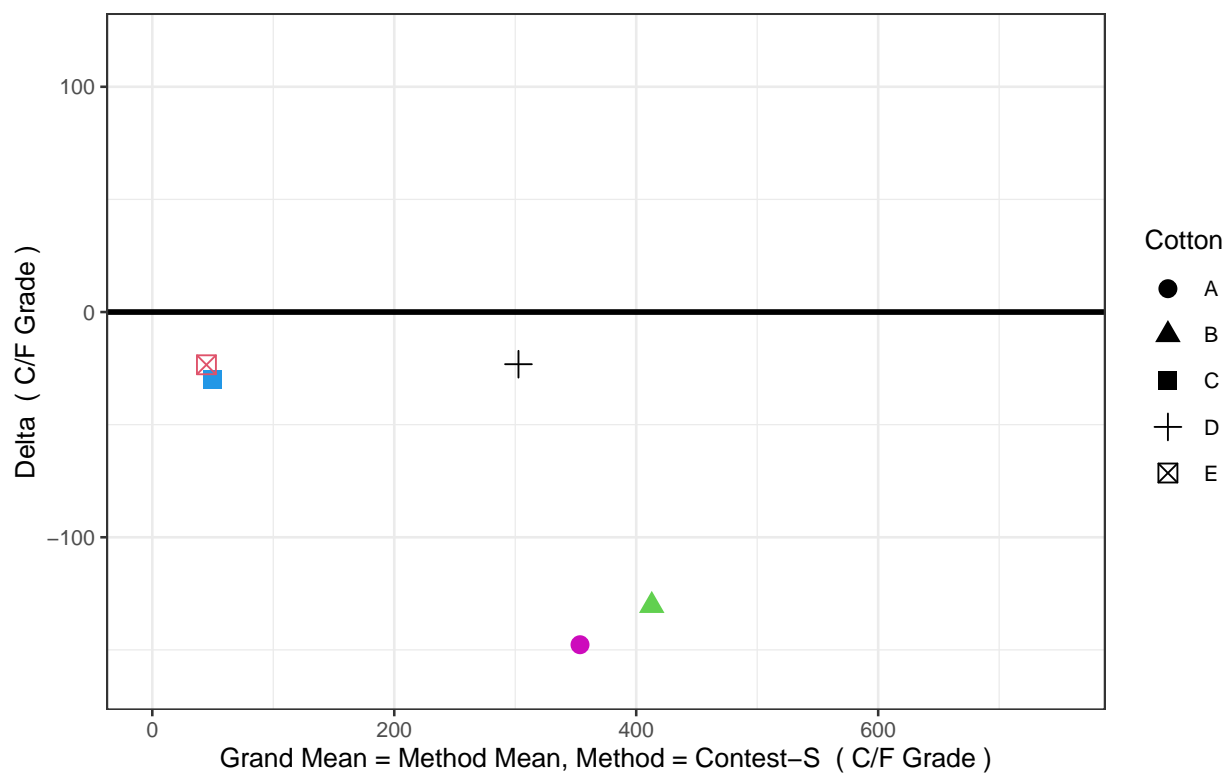
LabID = 45    Method = Caramelization ( Color degree )  
Delta = Lab Mean – Method Mean



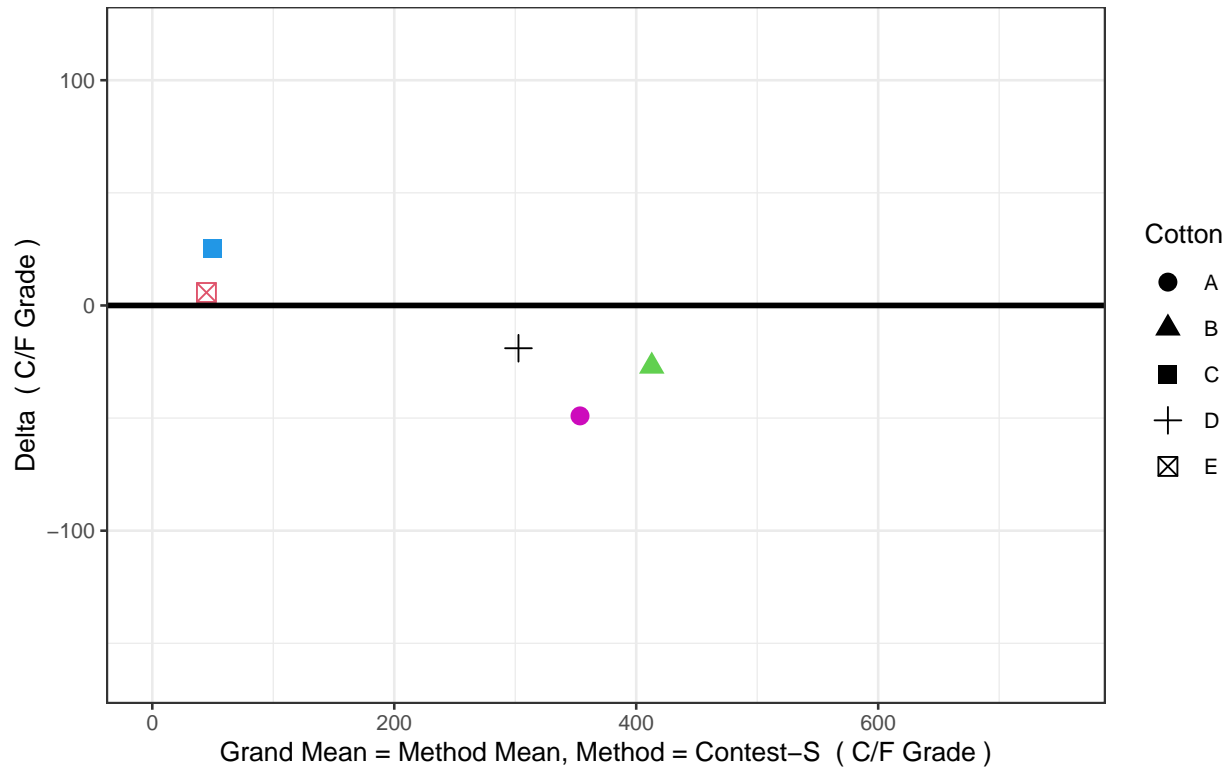
# CSITC type chart for Method Contest-S

LabID = 50    Method = Contest-S ( C/F Grade )

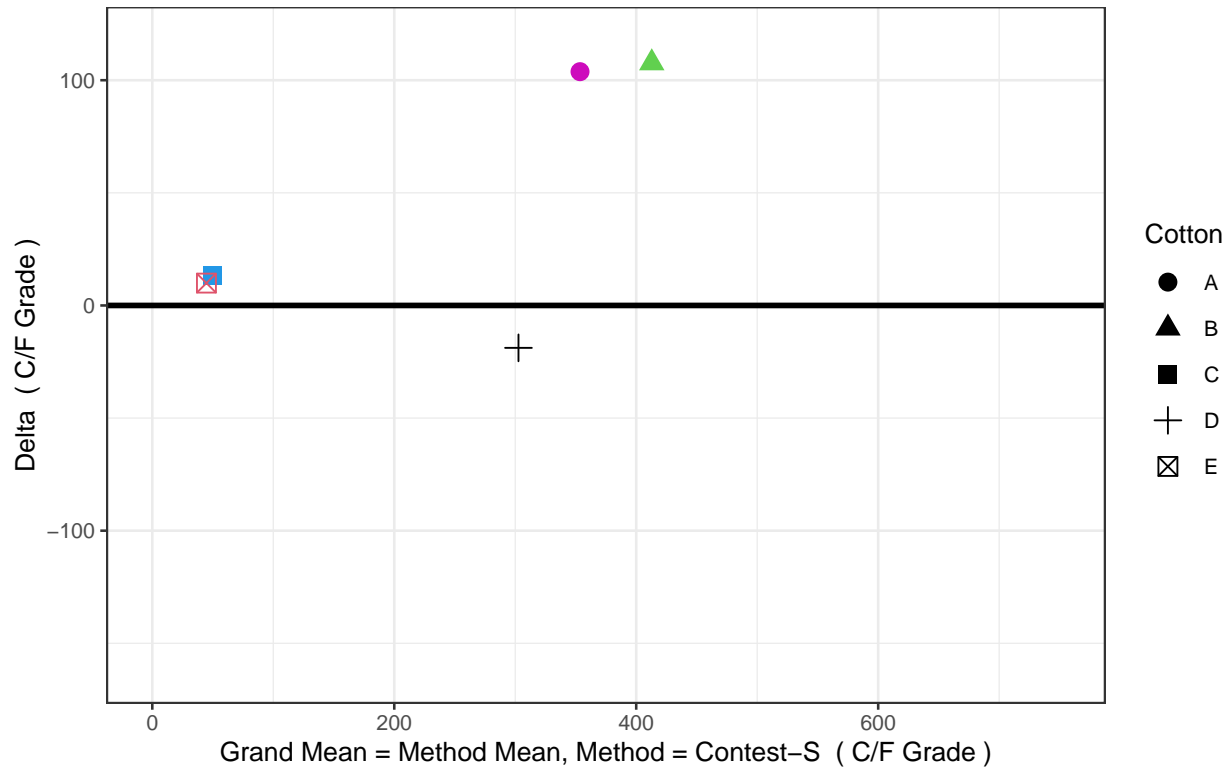
Delta = Lab Mean – Method Mean



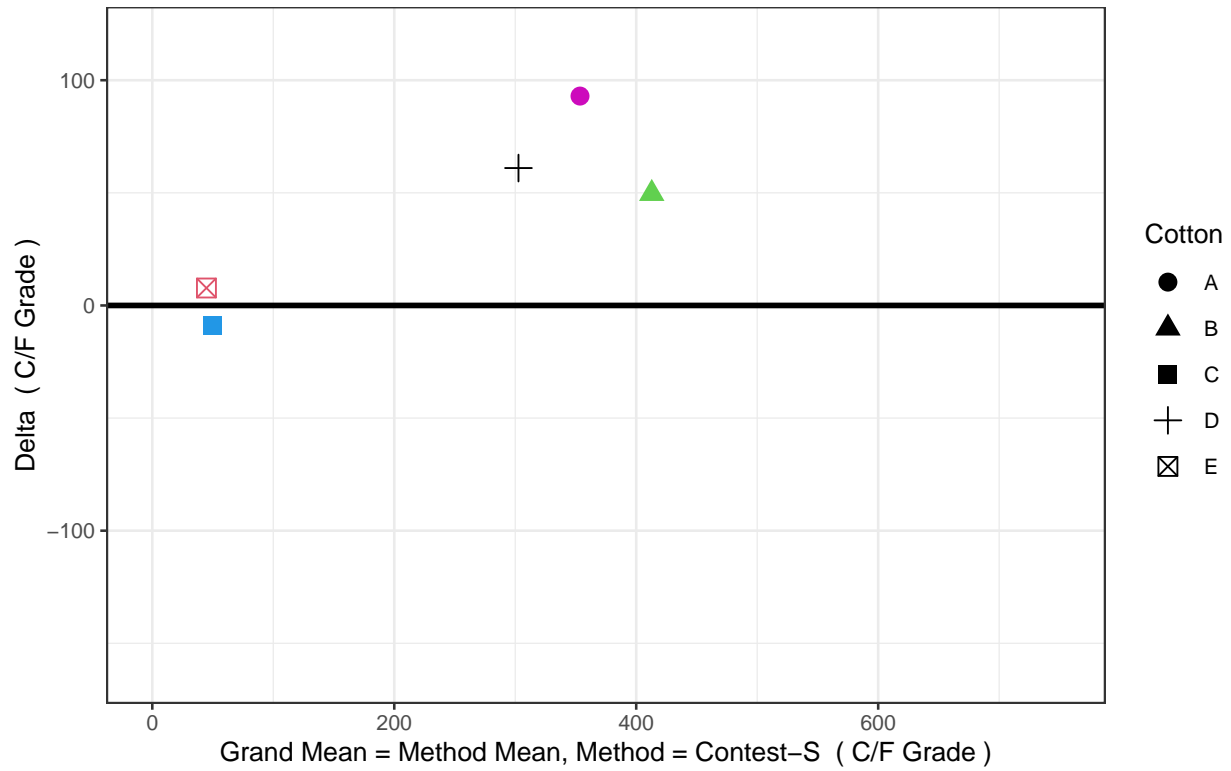
LabID = 70    Method = Contest-S ( C/F Grade )  
Delta = Lab Mean - Method Mean



LabID = 75    Method = Contest-S ( C/F Grade )  
Delta = Lab Mean - Method Mean

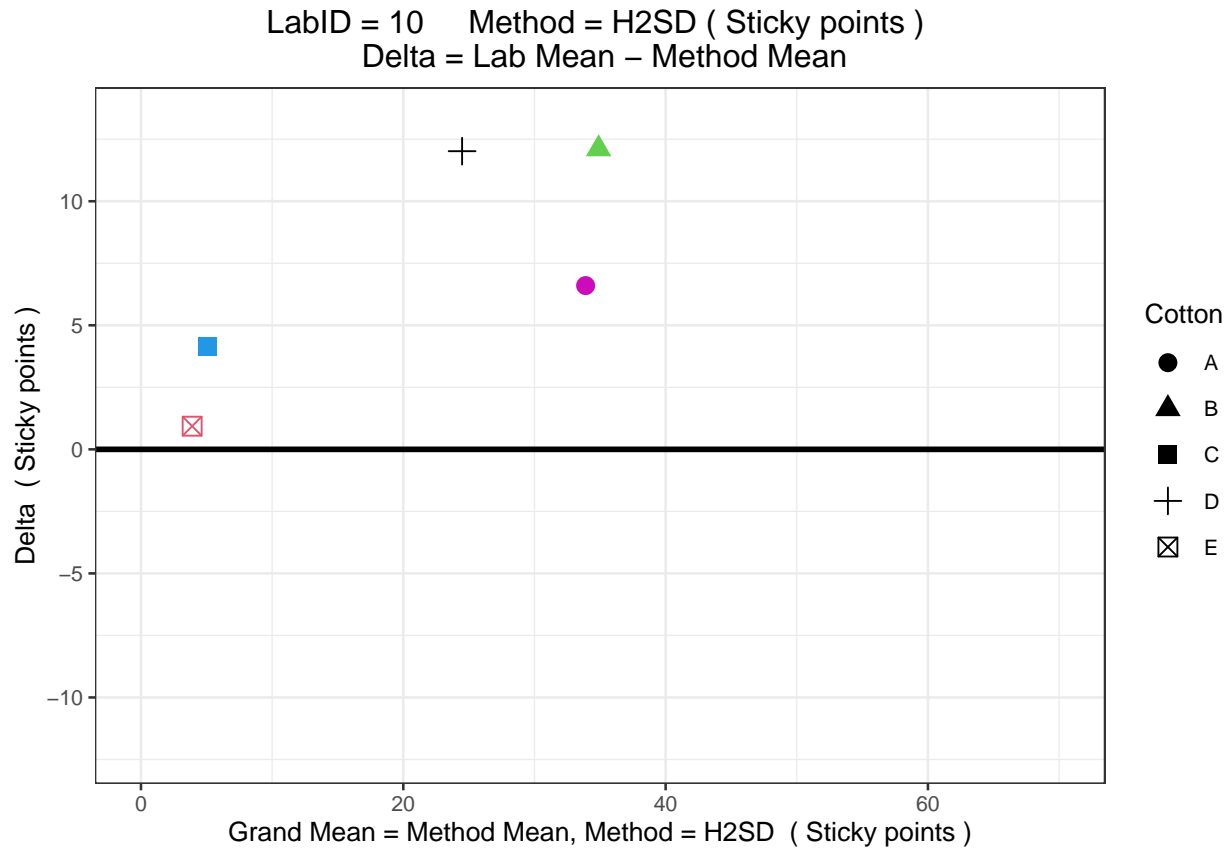


LabID = 80    Method = Contest-S ( C/F Grade )  
Delta = Lab Mean - Method Mean

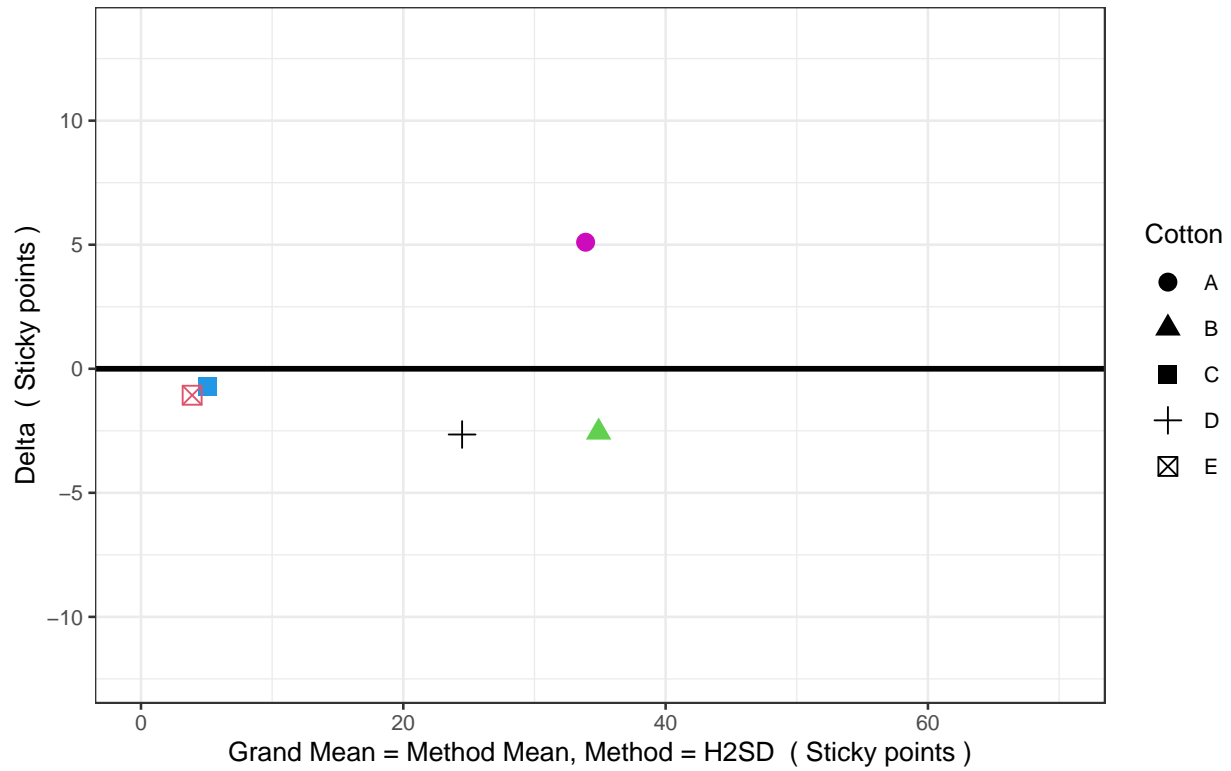




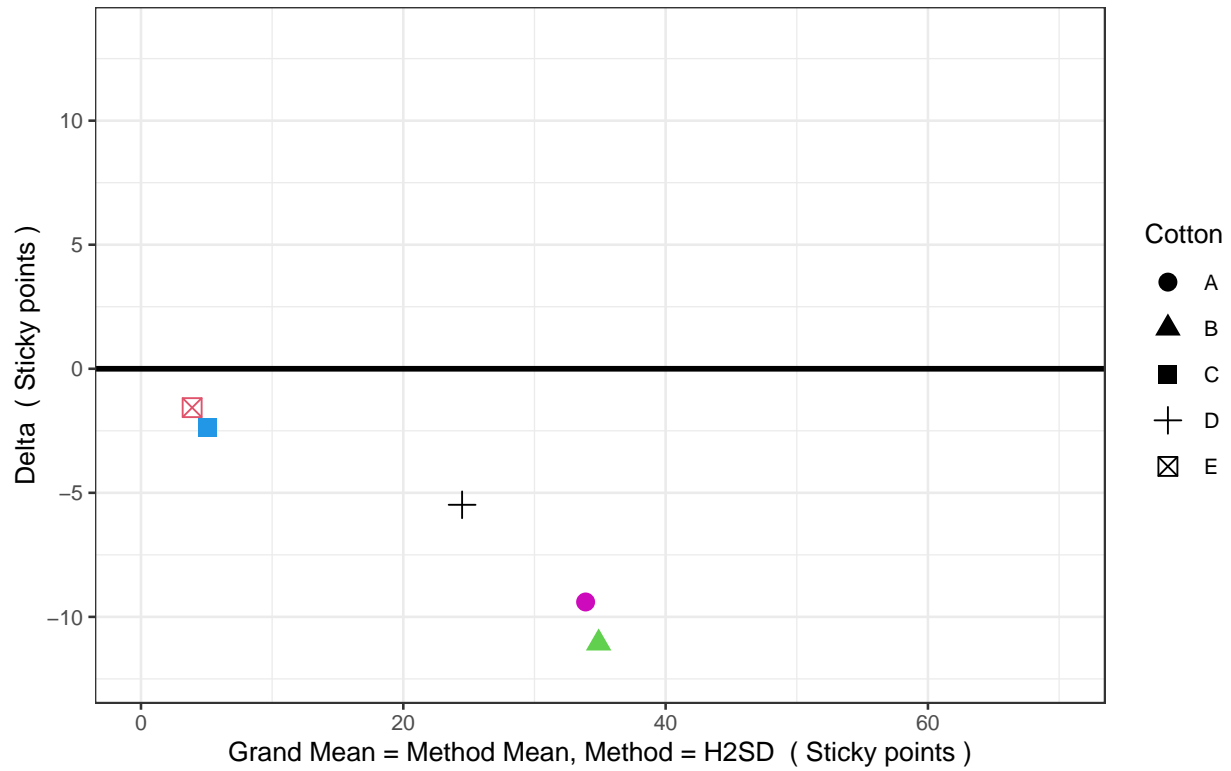
CSITC type chart for Method H2SD



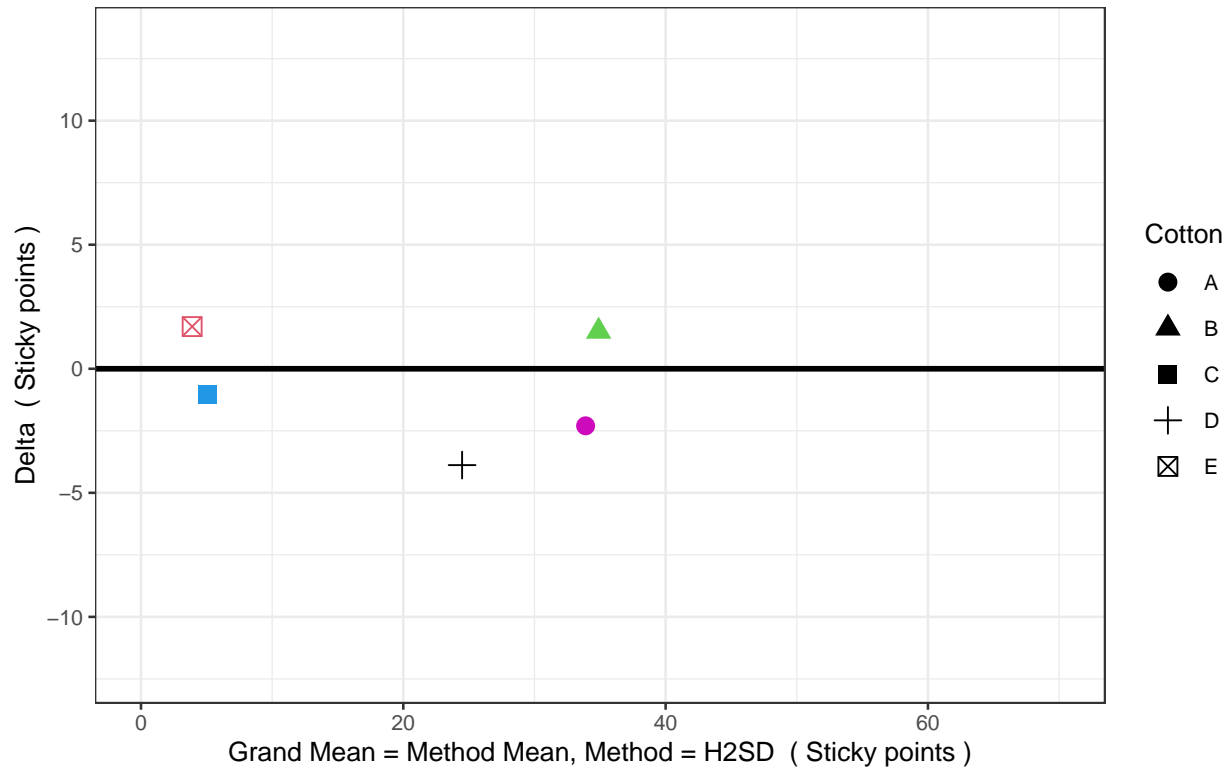
LabID = 35    Method = H2SD ( Sticky points )  
Delta = Lab Mean – Method Mean



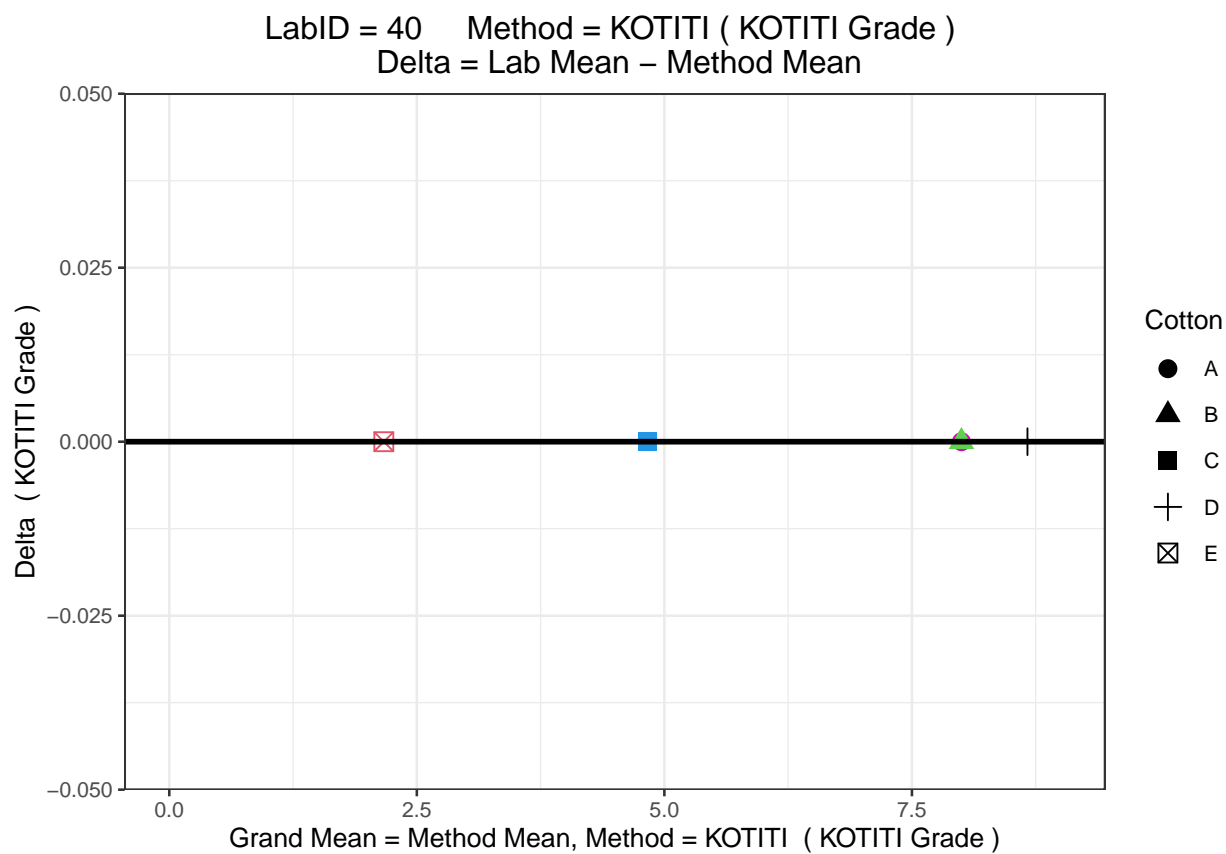
LabID = 60    Method = H2SD ( Sticky points )  
Delta = Lab Mean – Method Mean



LabID = 85    Method = H2SD ( Sticky points )  
Delta = Lab Mean – Method Mean



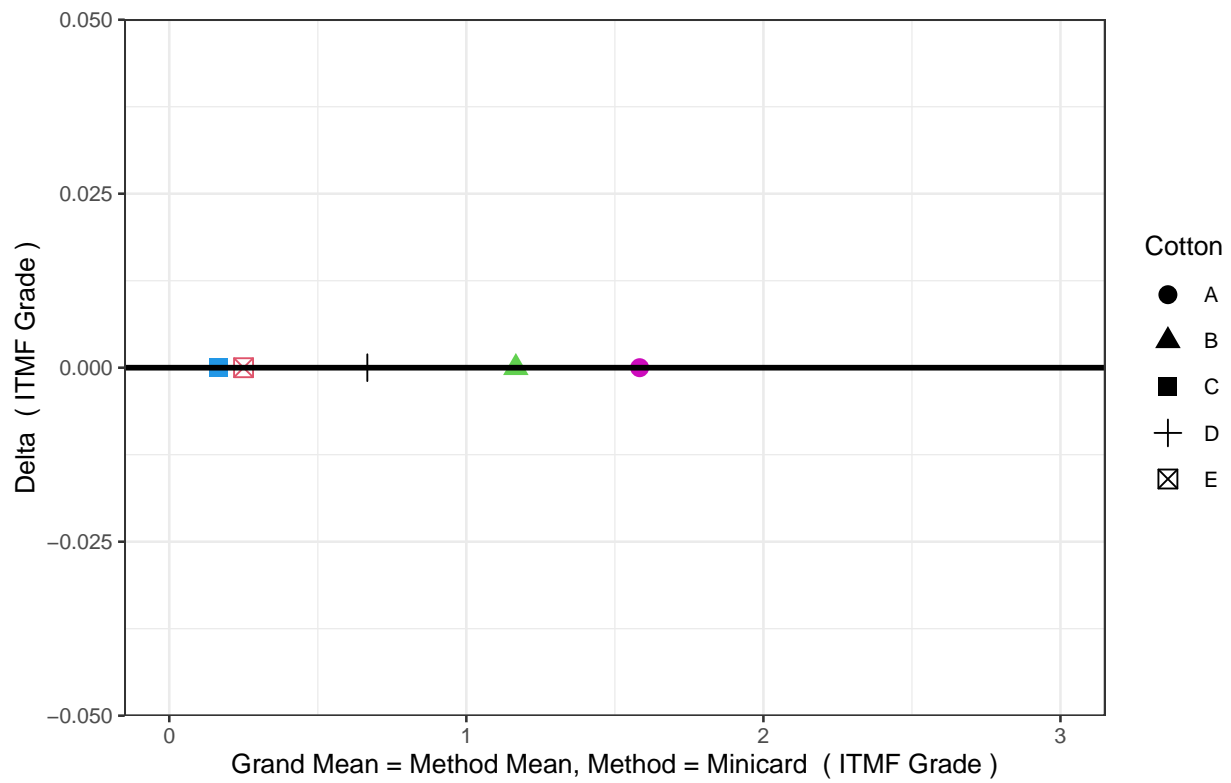
# CSITC type chart for Method KOTITI



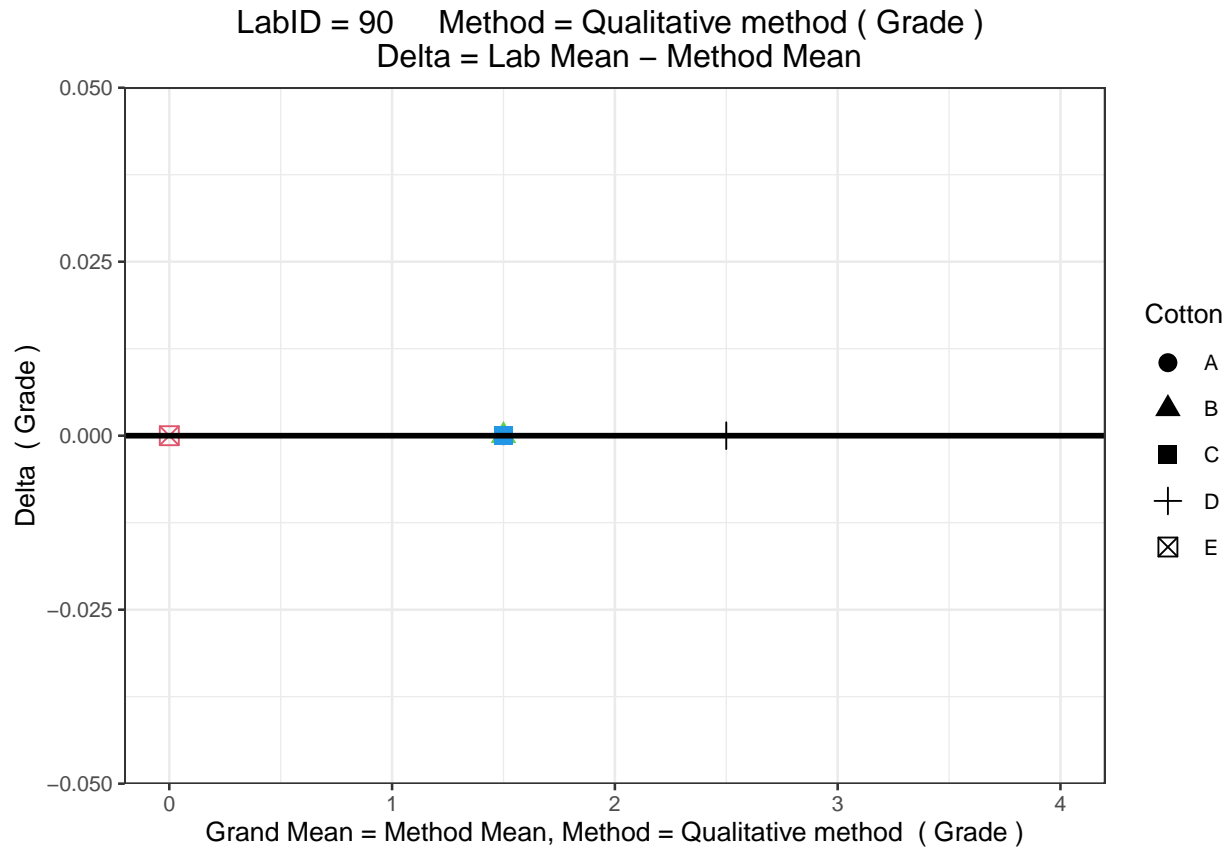
# CSITC type chart for Method Minicard

LabID = 15    Method = Minicard ( ITMF Grade )

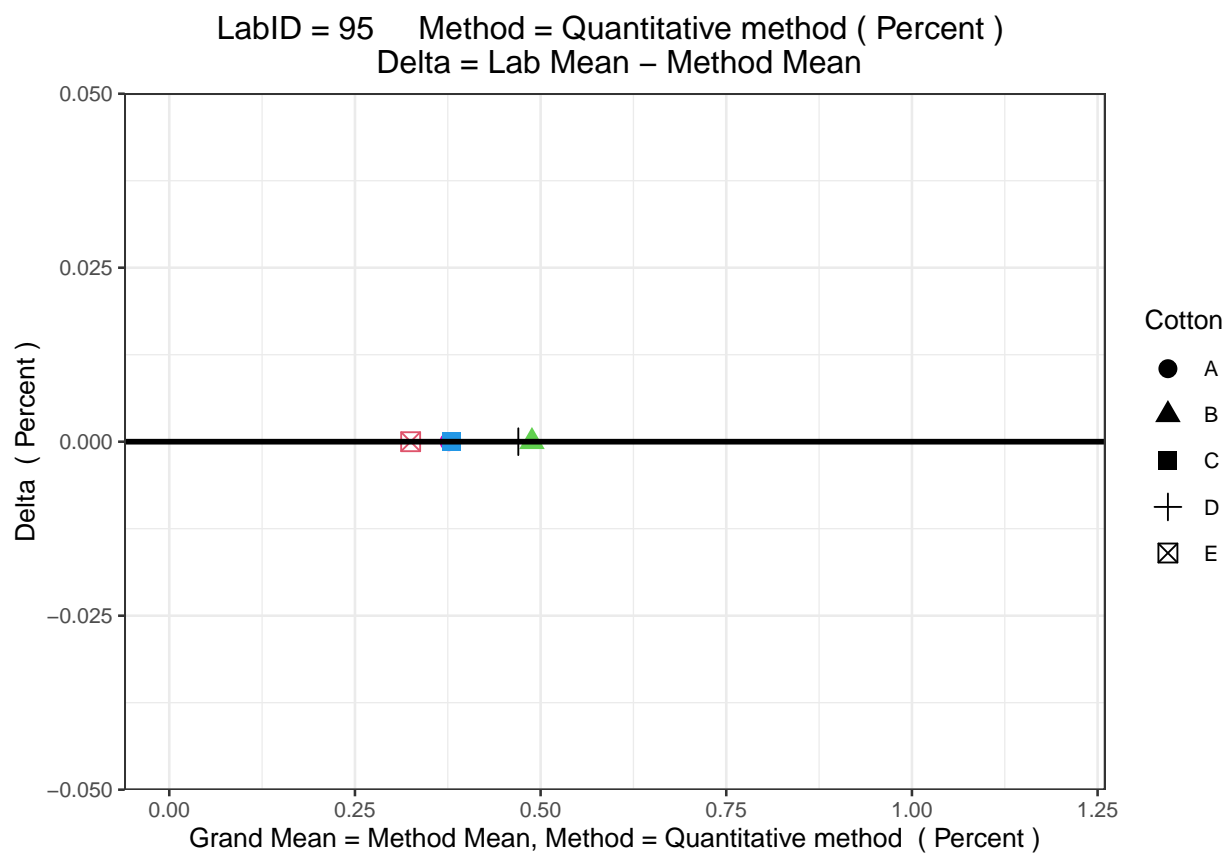
Delta = Lab Mean – Method Mean



CSITC type chart for Method Qualitative method



# CSITC type chart for Method Quantitative method



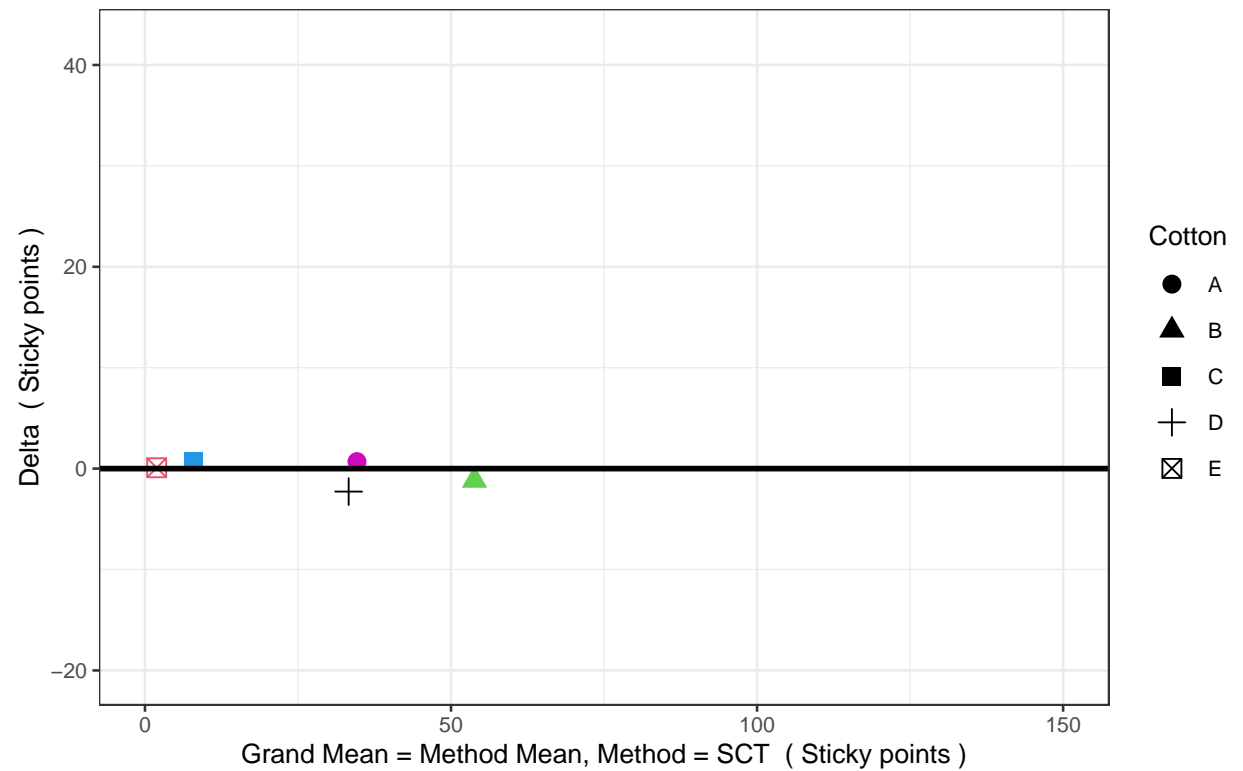


# CSITC type chart for Method SCT

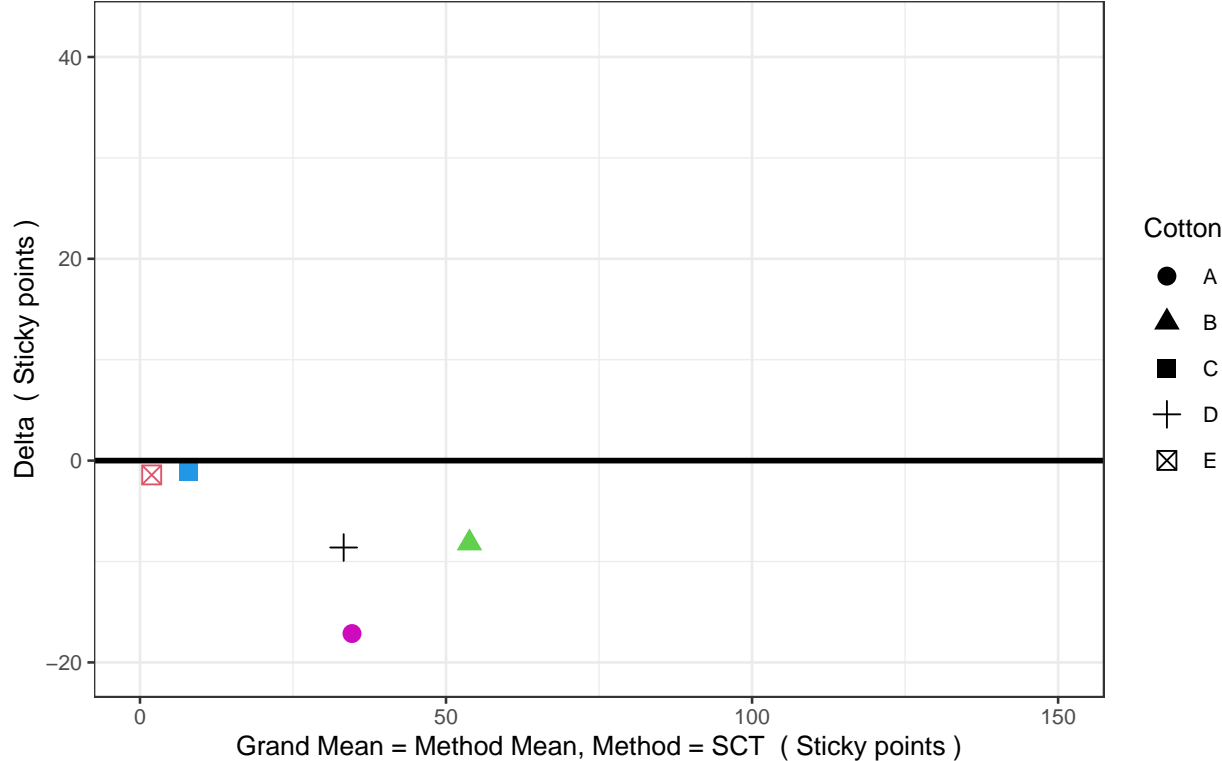
LabID = 20    Method = SCT ( Sticky points )  
Delta = Lab Mean – Method Mean



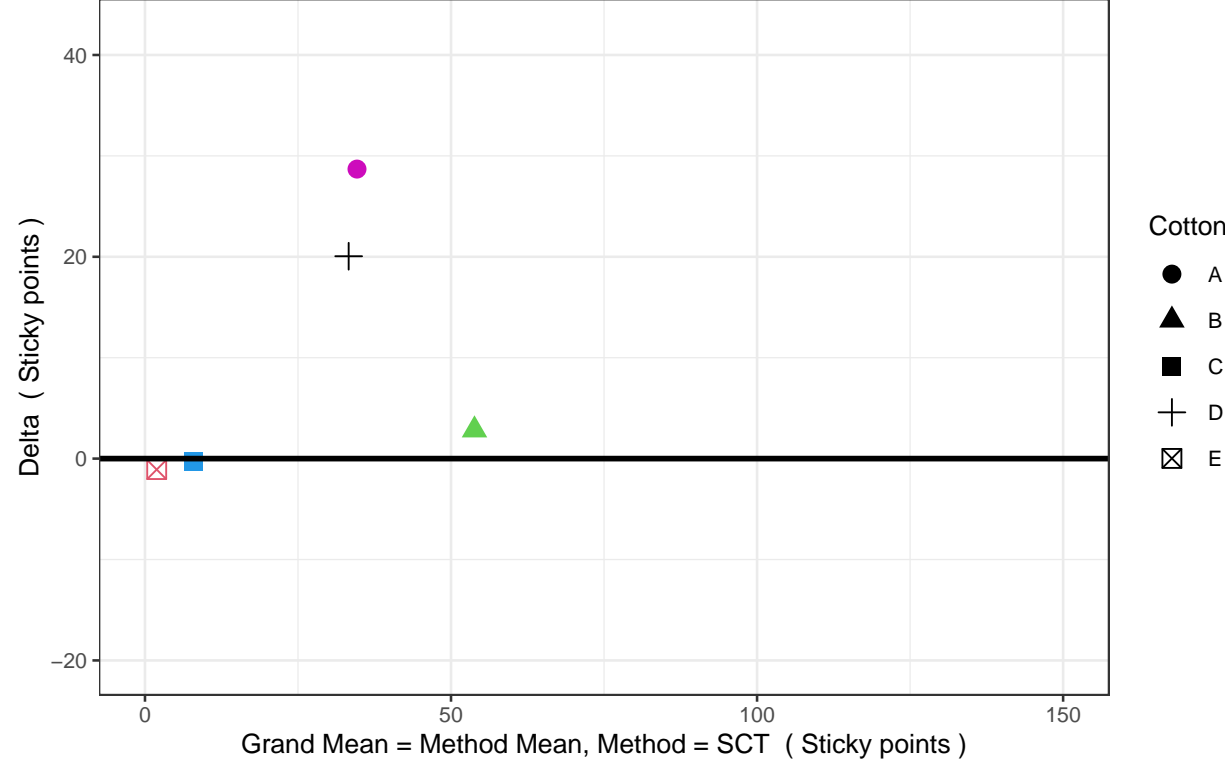
LabID = 25    Method = SCT ( Sticky points )  
Delta = Lab Mean – Method Mean



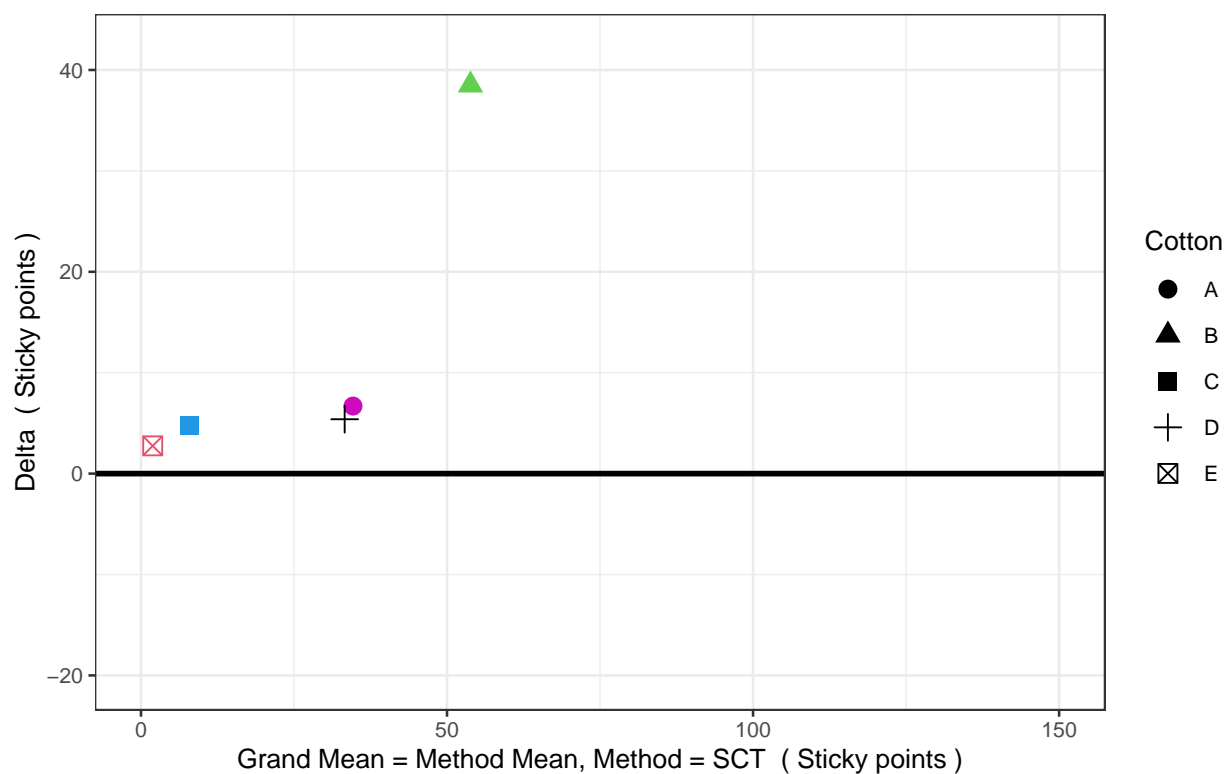
LabID = 55    Method = SCT ( Sticky points )  
Delta = Lab Mean – Method Mean



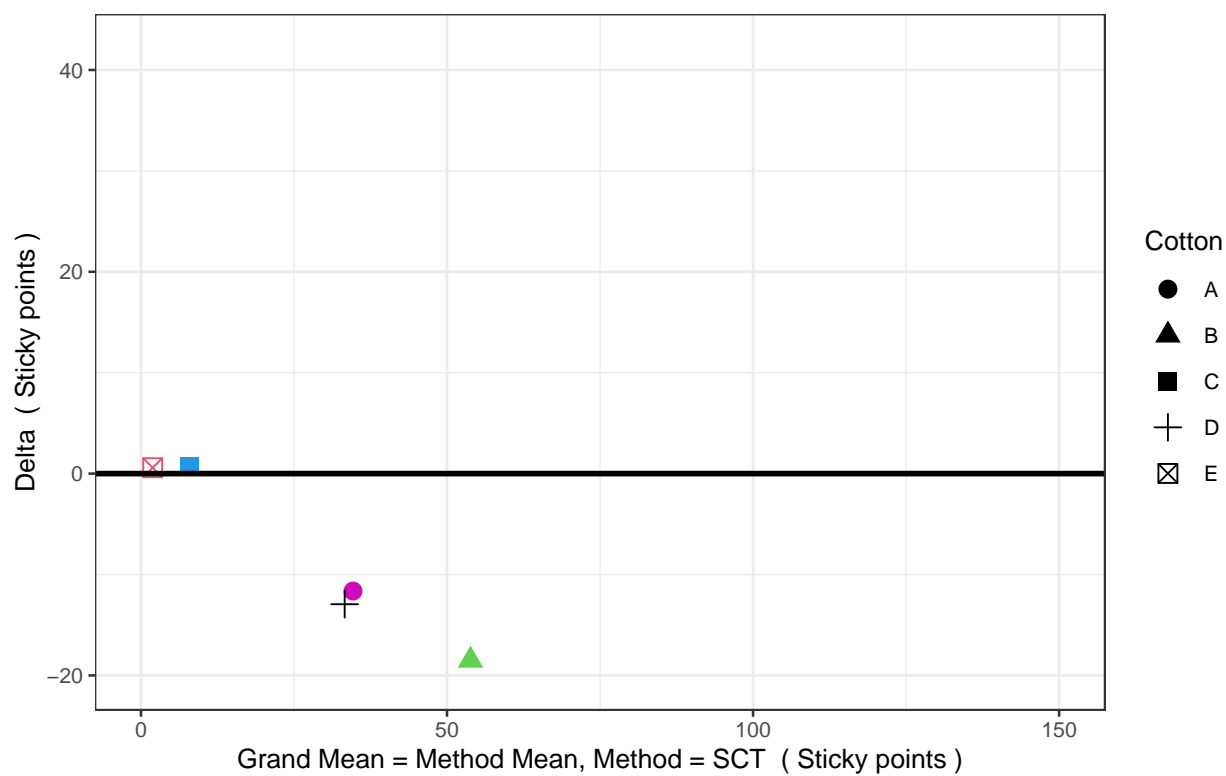
LabID = 65    Method = SCT ( Sticky points )  
Delta = Lab Mean – Method Mean



LabID = 100    Method = SCT ( Sticky points )  
Delta = Lab Mean – Method Mean



LabID = 105    Method = SCT ( Sticky points )  
Delta = Lab Mean – Method Mean



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## CommonScale <sup>7</sup>

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### Principle

In ITMF-ICCTM meeting organized in March 2018 in Bremen, it was envisaged to compare results from various stickiness methods to check how close are the gained results. A proposal using a pro-rata approach was made as one way to achieve this comparison. The following table gives the numeric values to which each and all results from this round-test were calculated with the following formula:  $CommonScale = \frac{LabID \text{ reading} * 100}{MaxEver \text{ for this method}}$ , with MaxEver being the maximum value that any given method could read for the most sticky cotton ever. This will continue as long as necessary.

During this ITMF-ICCTM meeting in March 2018, it was also mentioned that MaxEver may not be the best way to base the provided calculations for COMmonScale. We then expect Participating Laboratories to propose an other calculation method(s), which then would be added to this report in the future.

Method	MaxEver	Unit
Caramelization	7.0	Color degree
Contest-S	750.0	C/F Grade
H2SD	70.0	Sticky points
KOTITI	9.0	KOTITI Grade
Minicard	3.0	ITMF Grade
Qualitative method	4.0	Grade
Quantitative method	1.2	Percent
SCT	150.0	Sticky points

For instance,

- a reading of 2 at the minicard, with a MaxEver set at 3, will convert into a CommonScale reading of:  
 $67 = \frac{2 * 100}{3}$ .
- a reading of 63 at the SCT, with a MaxEver set at 150, will convert into a CommonScale reading of:  
 $42 = \frac{63 * 100}{150}$ .
- *etc.*

---

<sup>7</sup>Footnote

\* In the following charts, ML stands for the code Method x LabID.

\* In the following charts, LM stands for the code LabID x Method.

\* NA excluded

\* Black dashed line = Method MeanInterLab per cotton and per Method.

\* Red + = Laboratory mean for the given method and for the given cotton.

\* Black x = Laboratory or CommonScale reading or individual reading for the given method and for the given cotton.

## Limitations of the CommonScale approach

This approach has potential limitations:

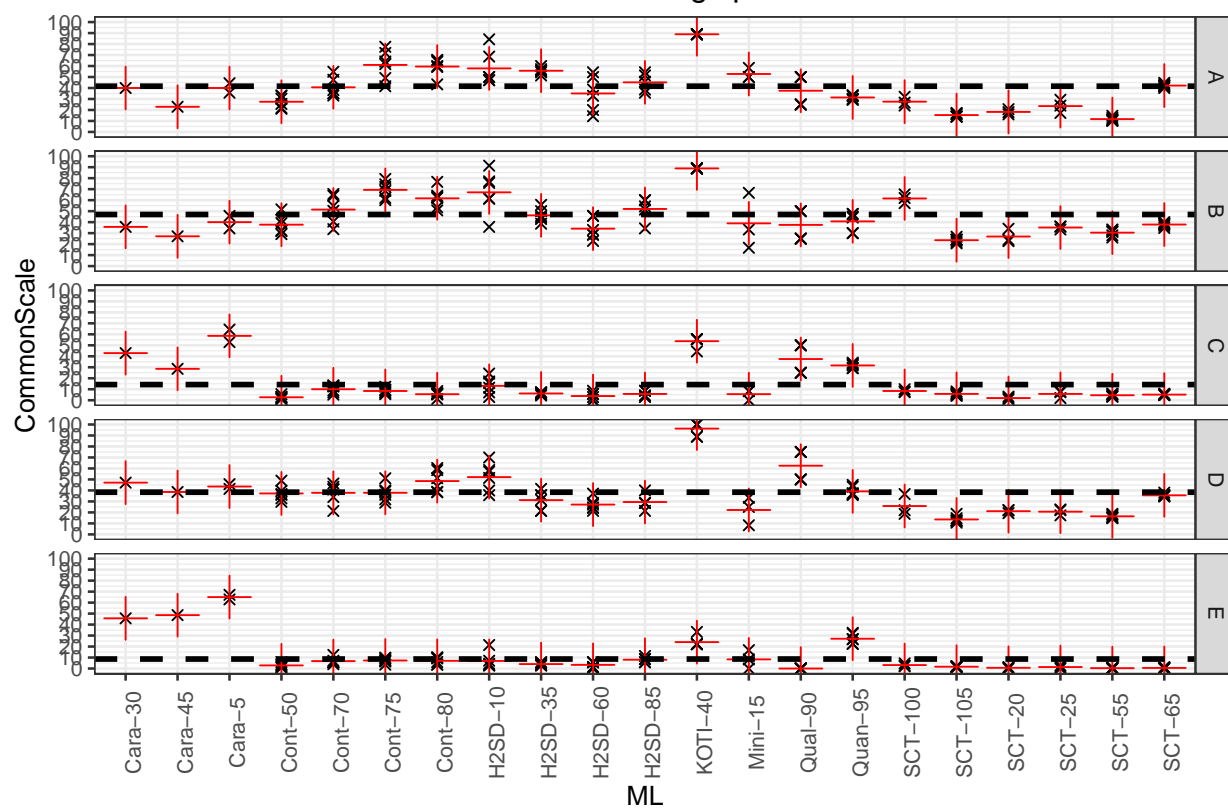
- The resolution of CommonScale results is not equivalent for methods having a discrete scale, especially when the number of levels is low (for instance, levels for minicard stickiness grading is limited to 4 [0, 1, 2 and 3]) letting the corresponding CommonScale only limited to 0, 33, 67 and 100 results. In the same time, other methods having counts expressed in sticky points on extended scales for instance have lot more possibilities, as well as method being able to measure according to a continuous scale.
- **It only is safe to compare methods that are measuring the same single phenomenon, stickiness, or phenomenon that are related to stickiness.** At this point in time, it is not given that all present methods are measuring ‘stickiness’ or criterion that are related to stickiness.
- This CommonScale approach provides results that still are cotton dependent.
- This CommonScale approach may squeeze the scale for lower or highly stickiness contaminated cottons.
- This CommonScale approach may therefore have incidence on precision and accuracy of gained results.

As a conclusion, as said earlier, CommonScale will be experimented at least for some round-tests in order to see if it could help Manufacturers and Users ***to get closer and closer results for each method for the same cottons over time.*** On the long run, the ability of each method to characterize stickiness ***in its strict sense*** will have to be evaluated to go further in the harmonization process; this could be by restricting some method(s) to be present in this round-test if they do not predict well enough stickiness troubles: a procedure has to be developed accordingly.

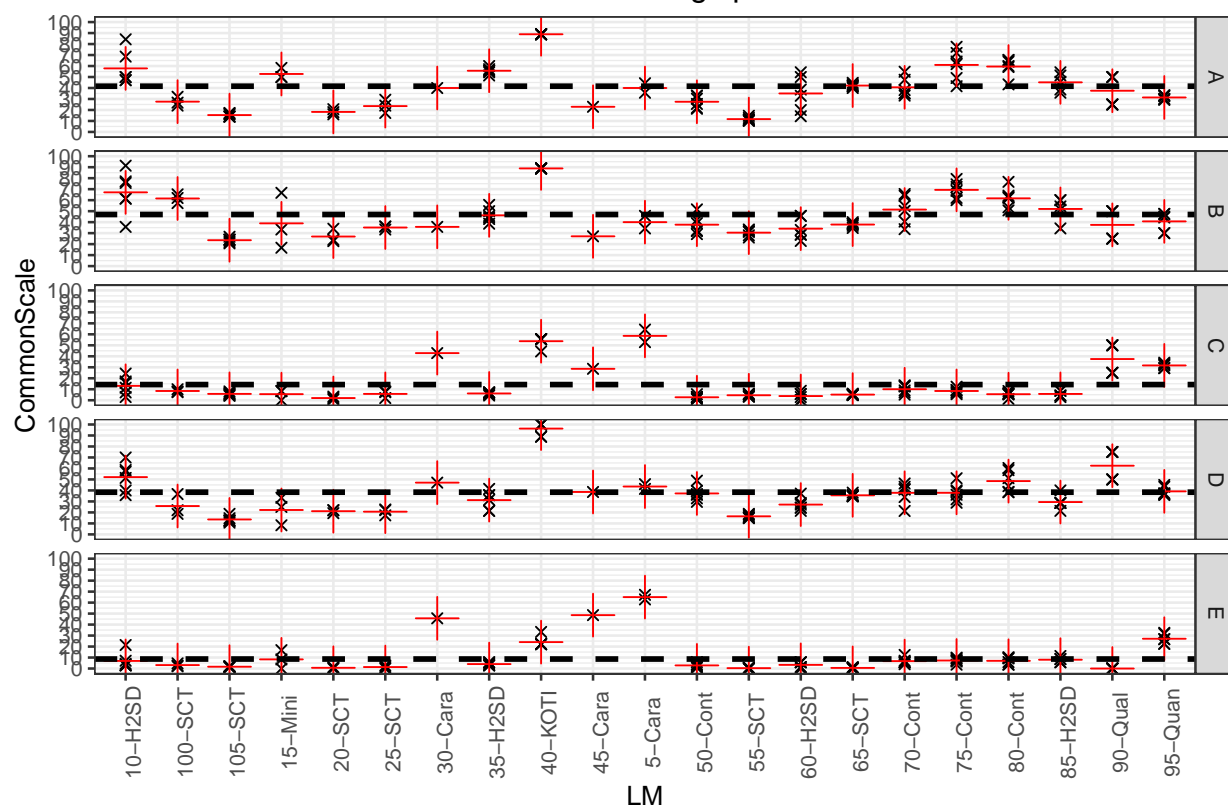


## CommonScale charts

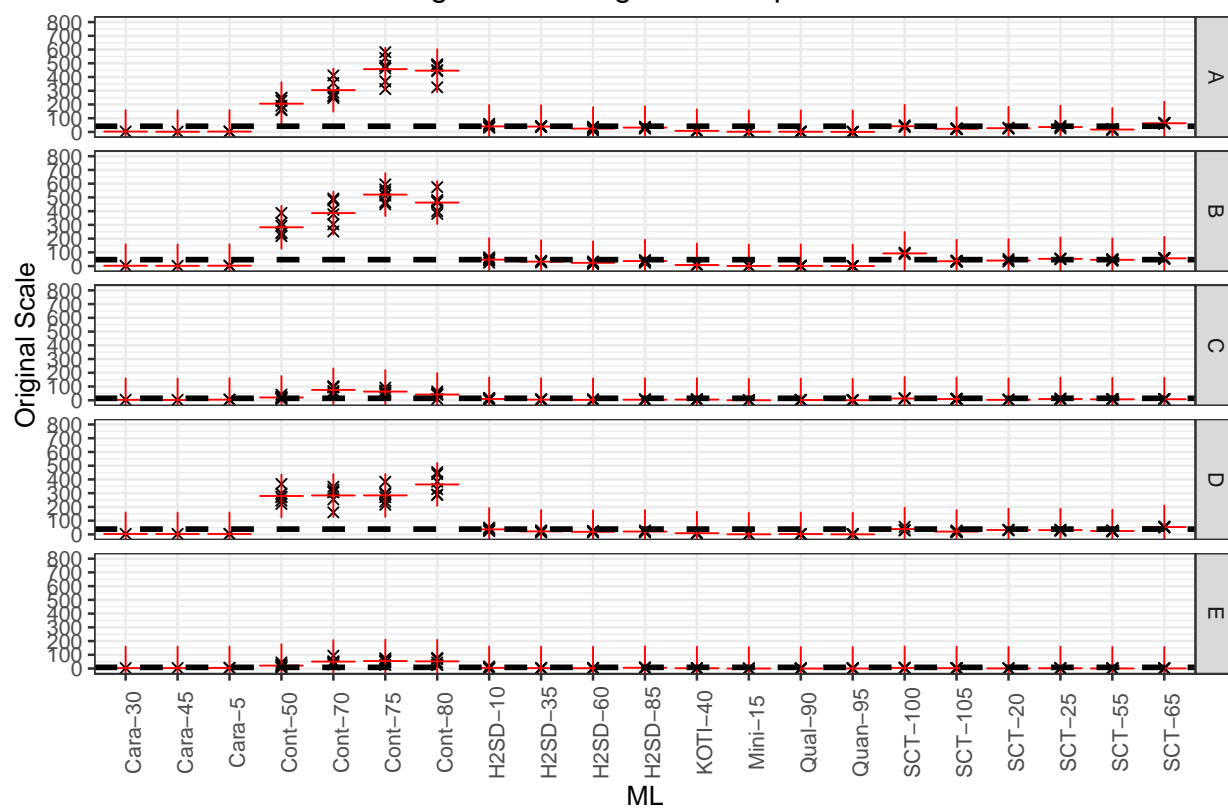
Individual CommonScale readings per Method and LabID



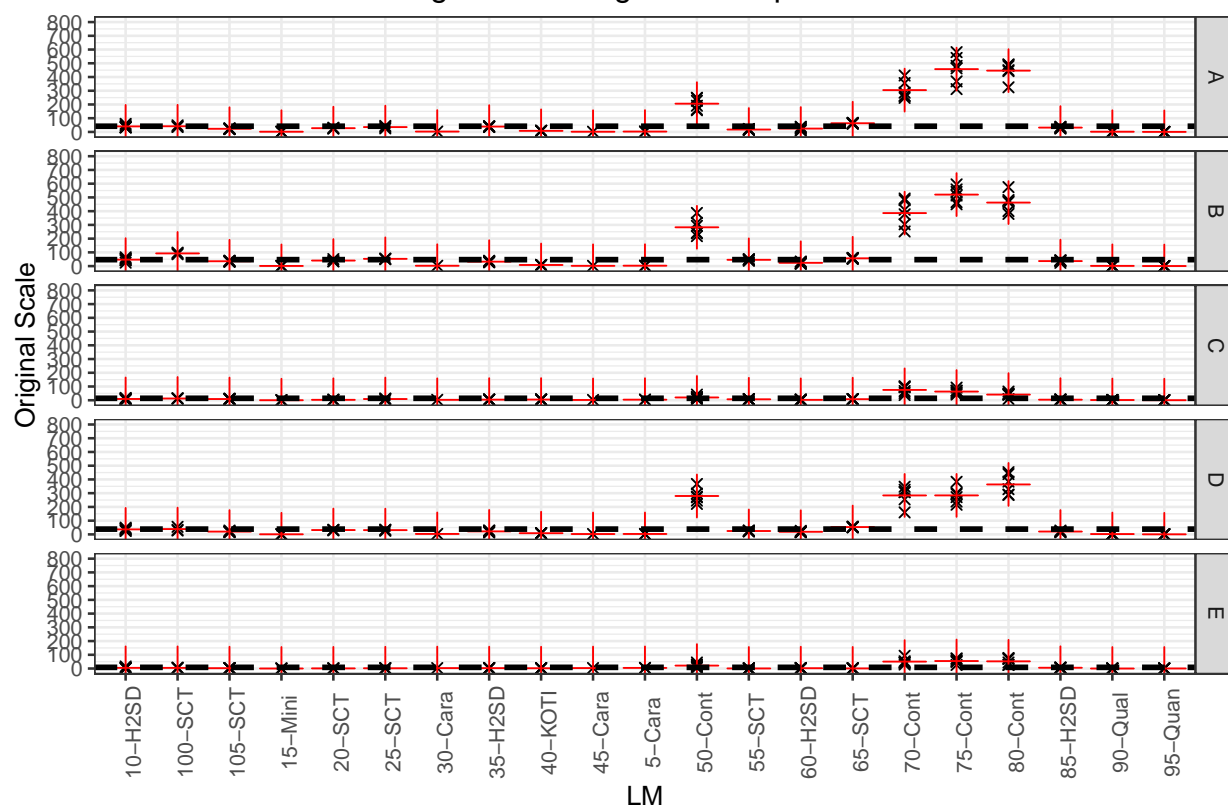
Individual CommonScale readings per LabID and Method



Individual readings in their original scale per Method and LabID



Individual readings in their original scale per LabID and Method



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## Overall statistics per Cotton and Method <sup>8</sup>

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The following tables provide information about observed variations between results of various instruments within each method, for each of all used methods and for each and all cottons used in this round-test.

- Comparing the CVs between the lines of these tables - meaning comparing methods for each cotton - is not helpfull at all, as units used are very different between methods (so different that it has been necessary to create the CommonScale approach just displayed above to get a way of comparing results).
- However seing the evolution of these CV values over time, Method by Method, will inform about the degree of harmonization achieved for stickiness measurement. A decrease of the CV values between instruments for each Method - which is expected over time - will give indications about the degree of care taken by Laboratories and Manufacturers to harmonize results over time for their respective methods.

---

<sup>8</sup>Footnote

\* NA or NaN excluded from the orginal raw data \* NA appears in the following tables when less that two laboratories provided data for the given cotton and method

\* Mean and Standard Deviation expressed in Unit, CV expressed in %

# Mean, standard deviation and CV between instruments by method, Cotton A

Method	MeanInterLab	SdInterLab	CVInterLab	Unit
Caramelization	2.4	0.7	28.9	Color degree
Contest-S	353.5	120.6	34.1	C/F Grade
H2SD	33.9	7.4	21.8	Sticky points
KOTITI	8.0	NA	NA	KOTITI Grade
Minicard	1.6	NA	NA	ITMF Grade
Qualitative method	1.5	NA	NA	Grade
Quantitative method	0.4	NA	NA	Percent
SCT	34.6	16.4	47.5	Sticky points

# Mean, standard deviation and CV between instruments by method, Cotton B

Method	MeanInterLab	SdInterLab	CVInterLab	Unit
Caramelization	2.4	0.5	19.1	Color degree
Contest-S	412.8	102.9	24.9	C/F Grade
H2SD	34.9	9.6	27.6	Sticky points
KOTITI	8.0	NA	NA	KOTITI Grade
Minicard	1.2	NA	NA	ITMF Grade
Qualitative method	1.5	NA	NA	Grade
Quantitative method	0.5	NA	NA	Percent
SCT	53.8	20.4	37.9	Sticky points



# Mean, standard deviation and CV between instruments by method, Cotton C

Method	MeanInterLab	SdInterLab	CVInterLab	Unit
Caramelization	3.0	1.1	34.6	Color degree
Contest-S	49.9	24.3	48.7	C/F Grade
H2SD	5.0	2.8	56.4	Sticky points
KOTITI	4.8	NA	NA	KOTITI Grade
Minicard	0.2	NA	NA	ITMF Grade
Qualitative method	1.5	NA	NA	Grade
Quantitative method	0.4	NA	NA	Percent
SCT	7.9	3.1	39.6	Sticky points

# Mean, standard deviation and CV between instruments by method, Cotton D

Method	MeanInterLab	SdInterLab	CVInterLab	Unit
Caramelization	3.0	0.3	10.0	Color degree
Contest-S	302.7	40.7	13.5	C/F Grade
H2SD	24.5	8.1	33.1	Sticky points
KOTITI	8.7	NA	NA	KOTITI Grade
Minicard	0.7	NA	NA	ITMF Grade
Qualitative method	2.5	NA	NA	Grade
Quantitative method	0.5	NA	NA	Percent
SCT	33.3	11.7	35.1	Sticky points

# Mean, standard deviation and CV between instruments by method, Cotton E

Method	MeanInterLab	SdInterLab	CVInterLab	Unit
Caramelization	3.7	0.7	19.6	Color degree
Contest-S	44.8	15.7	35.1	C/F Grade
H2SD	3.9	1.6	40.1	Sticky points
KOTITI	2.2	NA	NA	KOTITI Grade
Minicard	0.2	NA	NA	ITMF Grade
Qualitative method	0.0	NA	NA	Grade
Quantitative method	0.3	NA	NA	Percent
SCT	1.9	1.5	80.6	Sticky points

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## Frequently asked questions (Q) and answers (A) <sup>9</sup>

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Q: Correlation matrix are sometimes difficult to read due to formatting; is there any improvement possible?

A: We search for a solution, probably for next RT. Sorry for the inconvenience in the meantime.

Q: For SCT, do we have to report the number of sticky points adhering to the top and the one adhering to the bottom aluminum foils in each cell of the provided Excel sheet, or do we have to report their sum?

A: \_ For SCT, please only report the sum of the counts observed on the top and bottom foils \_ in each cell of the Excel sheet; thanks.

Q: Why are the cells of the Excel form locked?

A: The cells are locked to avoid modifications in the template to enable our importing system 'to know' where to get each piece of information for placing and pasting it into a devoted cell in the data base system. This saves time and secures the data in its original state (avoiding typing mistakes). So please \_ make sure to use the proper Excel template: use the latest form that was sent together with the announcement of samples dispatch for sending back you results. \_

Q: What 'GB/T13785-1992' stands for?

A: GB/T13785-1992 stands for a Chinese standards called 'Test method for degree of sugar contains in cotton fibers – Colorimetry'.

Q: What 'H2SD' stands for?

A: H2SD stands for High Speed Stickiness Detector.

Q: What 'HSI-NIR' stands for?

A: HSI-NIR stands for Hyper Spectral Imaging based on Near Infra-red spectra.

Q: What 'SCT' stands for?

A: SCT stands for Stickiness Cotton Thermodetector.

Q: What 'TDM-A' stands for?

A: TDM-A stands for Thermo Detection Method, and A stands for a specific scale for designing the stickiness level.

To be complemented on demand.

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<sup>9</sup>Footnote

\* Based on all round-tests carried out already.

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## Software components to realize this report <sup>10</sup>

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**Software code version: December 15, 2020 by Jean-Paul Gurlot**

R version 4.0.2 (2020-06-22) Platform: x86\_64-w64-mingw32/x64 (64-bit) Running under: Windows 10 x64 (build 18363)

Matrix products: default

locale: [1] LC\_COLLATE=French\_France.1252 LC\_CTYPE=French\_France.1252 LC\_MONETARY=French\_France.1252 LC\_NUMERIC=C LC\_TIME=French\_France.1252

attached base packages: [1] grid stats graphics grDevices utils datasets methods base

other attached packages: [1] rmarkdown\_2.3 markdown\_1.1 ggplot2\_3.3.2 reshape2\_1.4.4 xlsx\_0.6.3  
xlsxjars\_0.6.1 rJava\_0.9-13 knitr\_1.29 readxl\_1.3.1

loaded via a namespace (and not attached): [1] tinytex\_0.25.1 xfun\_0.16 purrr\_0.3.4 colorspace\_1.4-1  
vctrs\_0.3.2 htmltools\_0.5.0 yaml\_2.2.1 rlang\_0.4.7 pillar\_1.4.6

[10] glue\_1.4.1 withr\_2.2.0 jpeg\_0.1-8.1 lifecycle\_0.2.0 plyr\_1.8.6 stringr\_1.4.0 munsell\_0.5.0 gtable\_0.3.0  
cellranger\_1.1.0 [19] evaluate\_0.14 labeling\_0.3 fansi\_0.4.1 highr\_0.8 Repp\_1.0.5 scales\_1.1.1 magick\_2.5.1  
farver\_2.0.3 bmp\_0.3

[28] png\_0.1-7 digest\_0.6.25 stringi\_1.4.6 tiff\_0.1-5 cli\_2.0.2 tools\_4.0.2 magrittr\_1.5 tibble\_3.0.3  
crayon\_1.3.4

[37] readbitmap\_0.1.5 pkgconfig\_2.0.3 ellipsis\_0.3.1 imager\_0.42.3 assertthat\_0.2.1 rematch\_1.0.1  
rstudioapi\_0.11 R6\_2.4.1 igraph\_1.2.6

[46] compiler\_4.0.2

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<sup>10</sup>Footnote

\* List of all R components for processing the data

[1] “ICCTM-ITMF-RTStick 2020-2\_Long\_2020-12-17\_Raw”

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## General conclusions about the results of this round-test

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At this point, some general conclusions can be drawn from the results of this round-test:

- Eight methods (in past RTS, up to 11 methods were participating) for measuring stickiness were used;
- Only twenty one instruments participated to this test; maybe the current pandemic is the reason for this low participation. On our side, we were not able to deliver samples to some laboratories due to restrictions by carriers.
- Levels of reading as well as units to express stickiness are quite different, confirming that maybe all methods are not exactly measuring the same property that all methods however name 'stickiness' by all methods. This could be a problem for the comparability of the measurements and the application of the results in processing;
- Variations in results are quite high between laboratories using the same method, inducing somewhat low levels of reproducibility in the measurements;
- This variation seems not evolving since RT2017-1; please see last comment below;
- If one would compare methods, it would require calculating a representative result for each of the used methods; however taking care of the observed large variability levels in the results - both within laboratory and between laboratories - a mean result or a median result per method would not be meaningful at this stage. When these levels of variability will decrease, such a comparison will be published for each round-test occurrence.
- As discussed in Bremen (March 2018), since RT 2018-1, a new chapter appeared in the full report about the CommonScale approach as a first attempt of harmonization within and between methods (the later, at the condition that all methods do measure stickiness which will have to be proven according to a procedure to be developed).
- As we assume that by showing their relative position of each laboratory on comparison with others will induce corrective actions to favor more harmonized results along time, we will run other occurrences of this stickiness round-test in the coming times.
- **We recommend laboratories to observe their position and deduce the potential corrective actions that will lead to more grouped results in the coming round-test occurrences.**

Finally, next round-test samples will be sent in the future for the test 2021-1. Messages will be sent to the mailbox of participating laboratories contacts.

**We will keep contact with all laboratories participating to RT2019-2 as long as possible during the pandemic. However, preparing and dispatching samples has a cost and we urge laboratories receiving samples to submit their results in due time.**

We stay at disposal for any additional discussion; we do hope to see you again during the coming next RT later within the coming months.

Thank you again for your participation and support.